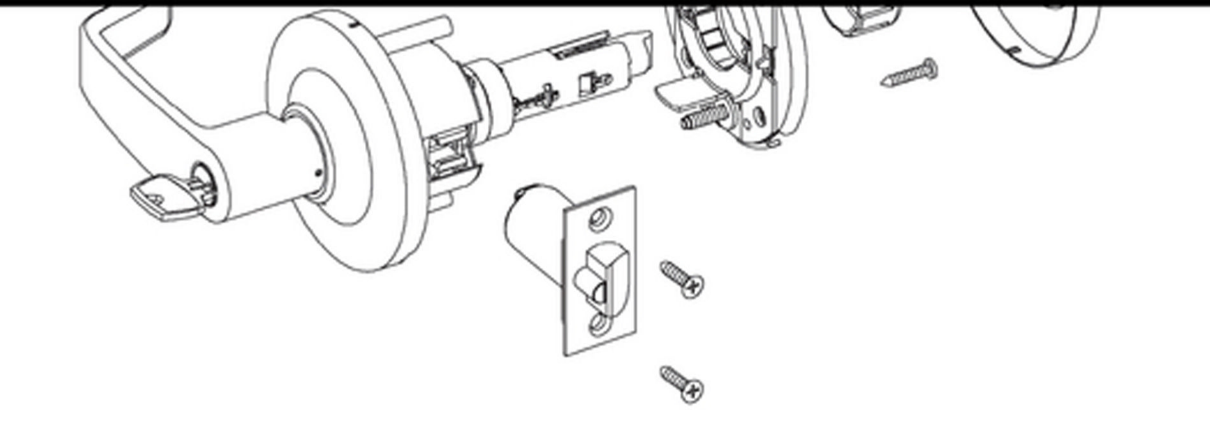



ILLUSTRATED GUIDE TO

DOOR HARDWARE: DESIGN, SPECIFICATION, SELECTION

SCOTT J. TOBIAS, AHC




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Foreword

Have you ever heard the statement, “Doors and hardware are easy” or “Doors and hardware are unimportant”? Perhaps you’ve even made those statements yourself. Are those statements true?

Let’s consider the first statement. I made that same statement before I researched the facts. There are thousands of products with millions of application combinations with building code compliance requirements. Suffice to say, doors and hardware are very complicated. Although they comprise approximately 2 to 3 percent of overall construction cost, doors and hardware typically comprise 25 to 30 percent of all punch list items.

Doors and hardware are also *very* important. Not only do they provide a protective barrier for people and property but more importantly, they save our lives! Think about what would happen if a raging fire would not be stopped by a secure fire door. Or how many times do we feel safe because we are behind a door locked to the outside? If we were in a building on fire, we would go directly to the nearest exit. What if that exit didn’t open? Thousands of people in the twentieth century lost their lives because of nonexistent fire and life safety codes and hundreds lost their lives as a result of noncompliance with existing codes. Yes, doors and hardware are *very* important—they save lives!

This publication is a guide on selecting proper doors and hardware by discussing functional options; building, fire, and life safety codes; proper materials; durability grades; and materials, as well as aesthetic finishes. Read this publication and use it as a reference when designing a building. You too can save countless lives.

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Architectural Development Manager
ASSA ABLOY Door Security Solutions

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Thank you to my family, friends, coworkers, and business associates who contributed to my experience, knowledge, and understanding of the door and hardware industry, which allowed me to create this manuscript. I would like to give a special thank you to my mom, Eileen Tobias, and to her brother, my Uncle Michael Haren for their support, guidance, and the time taken to introduce me to the industry and a new career over a summer break from college. Thank you to the many instructors, trainers, mentors, associations, and companies that have given me the opportunity to learn and grow while contributing to their businesses' success.

Thank you to Kathryn Malm Bourgoine, and the team at John Wiley & Sons for their patience and the opportunity to create this manuscript. Their guidance and support has been invaluable with the learning, understanding, and time that it took to complete this book—all truly appreciated.

As with everything that I do, I would like to thank my life partner and wife, Kathleen Knapp, for her love and support through the many years of research, stress, extensive traveling, and time away spent in my office in the evenings, weekends, and vacations to complete this project. I love you very much, wish for a life of health and happiness together, and dedicate this book to you.

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USER GUIDE

We know that when you are on a jobsite or in a meeting, questions come up. Even the most seasoned professionals may wish they could look up that one piece of information that is just outside of their instant recall or just beyond their current experience. There is a real need to make immediate onsite decisions to access information on the spot, no matter where you are.

Illustrated Guide to Door Hardware is designed to be a quick and potable reference for busy professionals like you. It focuses on the information you need away from the design desk, no matter where you are.

WHO THIS BOOK IS FOR

This book was written with the intent of assisting anyone in the construction industry working with architectural door hardware. By providing a basic understanding of components and how they are applied to work with the total door opening and information for a field review of existing or newly installed elements. This guide can also help with specifying and creating submittals for approval.

If you are an apprentice entering the door opening industry or an experienced door hardware professional studying for your Architectural Hardware Consultant (AHC) exam, a student in the profession of construction, an architect, a specification writer, a designer, an engineer, a general contractor, a construction manager, a carpenter installing door hardware, a manufacturer's representative or sales professional of door hardware, a distributor or subcontractor of door hardware, a locksmith, building maintenance staff, a building manager or facilities personnel, an owner, a user, or anyone else needing information regarding door hardware, this book is for you.

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HOW THIS BOOK IS ORGANIZED

This book is based on the Door and Hardware Institute (DHI) Standard Sequence and Format for the Hardware Schedule. Although this standard states the information and format required of door hardware schedules, it is also typically the same sequence and format used for specifying door hardware sets in project specifications.

There are many products, functions, applications, and component combinations that are available to be specified, furnished, and installed. The DHI Sequence and Format for the Hardware Schedule helps put order to the scheduling process to ensure that all applications, codes, and components are reviewed for proper operation, compliance, and function.

The Introduction describes the various associations, codes, standards, and practices of the industry, while the individual chapters follow the DHI Sequence and Format as follows:

- Hanging devices
- Securing devices
- Operating trim
- Accessories for pairs of doors only
- Closing and control devices
- Protective plates and trim
- Stops and holders
- Accessories
- Miscellaneous items
- Miscellaneous items (Yes, there are two categories for miscellaneous items.)

Each hardware device has the following sections, at minimum, with some devices having additional information:

- Also Known As—Any other industry or slang terms for the device
- Description—A brief overview of the device
- Properties—Various aspects of the device that create the whole
  - Finishes—Color of the device
  - Grades—Quality of the device
  - Materials—Metal, plastic, or other
- Types—Various kinds of the device
- Options—Variations of the device
- Quantities—How many of each device
- Applications—How the device is typically used
- Installation—How the device is installed
  - Fasteners—How the device is installed
  - Locations—Where the device is installed
  - Preparations—What the device is installed into

HOW TO USE THIS BOOK

Use the guide to:

- Learn door hardware components
- Learn how door hardware is applied

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- Identify existing field conditions
- Review newly installed hardware
- Specify door hardware
- Create detailed door hardware submittals for approval
- Have insight on installation issues and best practices
- Make better decisions when reviewing substitution requests

ABOUT THE AUTHOR

Scott Tobias is currently the Vice President of Architectural Development for ASSA ABLOY Door Security Solutions, the global leader in door opening solutions. Scott leads a national team of Door Opening Consultants, who assist the architectural and construction industries with architectural door and hardware education and total specification writing services, including the Construction Specifications Institute (CSI) MasterFormat®® sections in Division 08, with coordination of other related divisions and sections. With many committee and task team roles, Scott is also a past president for the NY Chapters of the Door and Hardware Institute (DHI) and Construction Specification Institute (CSI), and past president for the Northeast Region of CSI. Most recently serving 5 years on the Institute's national board for CSI, Scott is the current chairman of the Mid-Hudson chapter of ASIS International and serves on the Board of Governors for the Door and Hardware Institute.

Having earned employee awards, including the People Making a Difference Award, Scott has also received DHI's Award of Merit and two CSI Metro NY Special Commendation Awards. Chosen repeatedly for annual events such as CSI National Convention, CONSTRUCT, and AIA NYS Convention, Scott has also spoken at other industry events and provided continuing education to over 200 individual architectural firms throughout the country. Scott has eleven published articles in various magazines, including CSI's *The Construction Specifier*, DHI's *Door & Hardware*, and *Life Safety*, and *Cleaning and Maintenance*.

The rationale for this project is that there is currently no consolidated resource for the architectural door opening industry and related professionals' reference guide/handbook available. This type of resource would benefit the construction-related community by providing centralized information in order to expedite, verify, and limit the errors with the desired end result of a door opening.

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Introduction

The door opening industry affects many parts of the construction process as well as the everyday user of the door opening. To be effective, one needs to understand how each of the entities contributes and works individually and as part of the whole process. This Introduction will talk about various industry associations, such as the Door and Hardware Institute and the Construction Specifications Institute, and how they can help with the entire life cycle of a door opening and all of its touch points in the construction industry, from specification writing and substitution requests to door hardware schedule writing and submittal reviews.

ASSOCIATIONS

With the continuous changes in the world of architecture, design, sustainability, energy efficiency, technology, and product improvement, associations are becoming a more important part of our everyday responsibilities in the workplace. Associations are where we go to meet people with different roles and responsibilities who have the knowledge, experience, resources, products, networks, and connections to help us succeed in our professions.

AMERICAN INSTITUTE OF ARCHITECTS (AIA)

Founded in 1857, the American Institute of Architects (AIA) is a paid membership association for licensed architects, emerging professionals, and allied industry partners. With approximately 300 state and local chapters in the United States, the AIA hosts a continuing education program, and provides licensing, conventions, and networking events for its members.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

The American National Standards Institute (ANSI) was formed in 1916 and was the combined effort of numerous entities, including the American Institute of Electrical Engineers (IEEE), the American Society of Mechanical Engineers (ASME), the American Society of Civil Engineers (ASCE), the American Institute

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of Mining and Metallurgical Engineers (AIME), the American Society for Testing Materials (now ASTM International), and The U.S. Departments of War, Navy, and Commerce. The association was created to establish a national body to coordinate standards development and consensus approval of minimum standards.

The standards that ANSI develops are the minimum standards required for compliance. Some manufacturers go above and beyond the testing required, which can lead to a longer life cycle, fewer replacements, less cost to the owner, less labor, and fewer materials in a landfill, contributing to a sustainable world.

AMERICAN SOCIETY OF INTERIOR DESIGNERS (ASID)

Founded in 1975, the American Society of Interior Designers (ASID) is the oldest and largest paid member association, with over 30,000 members with careers primarily in interior design, industry product representation, and design education, and students of design. The association and its 48 chapters throughout the United States and Canada provide networking opportunities, educational events, and conventions for their members and guests of the industry.

ASIS INTERNATIONAL

Founded in 1955 and formerly known as the American Society of Industrial Security, ASIS International is a paid member association with over 38,000 members in 232 chapters worldwide. ASIS International is dedicated to providing education, conventions, and networking events in order to increase the effectiveness and productivity of security professionals around the world.

ASTM INTERNATIONAL (ASTM)

Founded in 1898 as the International Association for Testing Materials (IATM), ASTM International is committed to building a consensus on standards for industrial materials. The association sets the standards for testing of materials that are used in construction, including some door hardware.

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

Founded in 1925 as the Builders Hardware Manufacturers Statistical Association, the BHMA is known for its leadership with setting the minimum standards for door hardware. Most door hardware manufacturers are members of the BHMA and test their products to meet the minimum standards. With that said, there are manufacturers who test their products well above and beyond the minimum standards. This is an important fact to know when choosing door hardware to specify and install, as a proven longer life cycle will mean fewer replacements of product, which means less labor and less cost, and is sustainable by contributing less waste in a landfill.

The BHMA has partnered with the American National Standards Association (ANSI) to publish the ANSI/BHMA A156 Series Standards, which are a numbered series of standards that address all door hardware and its minimum testing requirements to meet those standards. In order to be BHMA certified, you must adhere to and pass third-party testing to ensure the products meet the standards. If a product fails, it is no longer certified. It is important to verify that products are BHMA certified and not just tested to meet the requirements of BHMA.

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CONSTRUCTION SPECIFICATIONS INSTITUTE (CSI)

Founded in 1948 by government agency specification writers, the Construction Specifications Institute (CSI) was formed to improve the quality of construction specifications, which in turn means better-quality construction. The institute expanded into the private sector and included design professionals, contractors, product representatives, and owners from the United States, who come together through chapter meetings, continuing education, conventions, and networking events to help each other share information beneficial to the quality of construction. CSI has a sister organization in Canada by the name of Construction Specification Canada (CSC).

In addition to other standards and formats, such as Page Format and UniFormat™, which is the organization of construction information based on function rather than material or method, OmniClass™ is a classification system used to organize project information. CSI is probably most known for creating the specifications standard MasterFormat®, which is a master list of numbers and titles used to organize specifications and other project information by material type for most commercial projects. MasterFormat® Section 08 71 00 Door Hardware is where all of the materials discussed in these chapters reside. Older versions of MasterFormat®, dated 1995 and prior, referred to the section as Finish Hardware or Door Hardware, and the numbering was only five digits, or 08710.

DOOR AND HARDWARE INSTITUTE (DHI)

With the roots of the institute dating back to 1934, the Door and Hardware Institute (DHI) is a paid annual membership–based association offering discounts for all education, services, and literature to their members. DHI was formed from other industry associations, namely the National Builders Hardware Association (NBHA) and the American Society of Architectural Hardware Consultants (ASAHC). As the industry resource for door opening standards, all industry professionals, including contractors, manufacturers, distributors, sales representatives, building officials, facility managers, architects, and others turn to DHI for education and certification. Any person or company entering or working in the door opening industry would be wise to join the DHI.

DHI offers certification programs, which require an individual to attend and pass a minimum number of educational courses offered by the organization. Once credentialed, members are required to take a minimum number of continuing education hours over a certain period of time to maintain the certification.

Those who obtained their certification prior to the continuing education requirements are "grandfathered in" and do not have to take continuing education courses to maintain their certification status. In addition to the Architectural Hardware Consultant (AHC) certification, DHI offers a Certified Door Consultant (CDC) and a Electrified Hardware Consultant (EHC), and if one obtains all three certifications, they are replaced with one Architectural Openings Consultant (AOC) certification, of which there are not many in the world today.

DHI also offers certification for other expertise such as the Fire Door Assembly Inspector (FDAI) program. In 2007, NFPA 80 put into place an annual inspection of fire doors, and soon after NFPA 101 followed. Another, later, component to the annual inspection included Egress, and the standards state that a knowledgeable person is allowed to inspect these openings. The Door and Hardware Institute, along with Warnock Hersey/Intertek, have put into place a certification and licensing program that teaches, and requires continuing education in, the proficiency that is required to be an expert in, such inspections.

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INTERNATIONAL INTERIOR DESIGN ASSOCIATION (IIDA)

Founded in 1994, the International Interior Design Association (IIDA) is a paid membership association of 13,000 members and 33 chapters around the world. The IIDA is the result of the merging of three associations: the Institute of Business Designers (IBD), the International Society of Interior Designers (ISID), and the Council of Federal Interior Designers (CFID). The intent of the merger was to create a unified association with one mission: to represent interior designers around the world.

UNDERWRITERS LABORATORIES

Formed in 1894, Underwriters Laboratories (UL) was founded as the Underwriters' Electrical Bureau, the Electrical Bureau of the National Board of Fire Underwriters, and was formed to test materials for safety. Today UL is a global third-party testing entity that continues to test materials for safe living and work environments.

UNITED STATES GREEN BUILDING COUNCIL (USGBC)

Formed in 1993, the United States Green Building Council (USGBC) is a paid membership association that was formed to promote sustainable building design and construction. Today, the USGBC includes architectural firms, nonprofit associations, manufacturers, designers, and anyone else concerned with sustainability and how to improve our construction processes to save the earth's resources and our lives. The USGBC formed the Leadership in Energy and Environmental Design (LEED) rating system to help those involved in the construction process to select, design, and build projects to a set of minimum standards. Today these voluntary standards are becoming more and more a code requirement.

WARNOCK HERSEY

Warnock Hersey is a third-party testing entity that tests products to meet the minimum requirements of fire testing, fire door labeling, performance, and other testing. You would most commonly find a Warnock Hersey label on a fire rated door or frame.

CODES

Codes and standards are available to set the minimum requirements of door openings. Some local jurisdictions have specific codes and standards, which were either modified from another existing code, typically the International Building Code, for their own use.

Language and section numbers can change slightly or drastically when the codes are updated. Look for an outline, if available, of the changes that took place in the respective update. Many code updates occur on a three-year cycle, although some might be updated more or less often. Also, codes might not be adopted in their original version or in their entirety, but rather parts of the whole may be incorporated.

INTERNATIONAL GREEN CONSTRUCTION CODE (IGCC)

The International Green Construction Code (IGCC) is published by the International Code Council (ICC), which was formed in 1994 as a nonprofit organization dedicated to developing a single set of comprehensive and coordinated national model construction codes. The ICC was a

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combination of the Building Officials and Code Administrators International, Inc. (BOCA), the International Conference of Building Officials (ICBO), and the Southern Building Code Congress International, Inc. (SBCCI).

The International Green Construction Code was created as the first model code to include sustainability measures for the entire construction project and site from design through construction and beyond through the entire building life cycle. The intent of the code is to make the design, construction, and maintenance of the buildings more efficient. Reduced waste and positive impacts on health, safety, and welfare are the expected outcomes of sustainably focused construction.

INTERNATIONAL BUILDING CODE (IBC)

The International Building Code (IBC) is published by the International Code Council (ICC), which was formed in 1994 as a nonprofit organization dedicated to developing a single set of comprehensive and coordinated national model construction codes. The ICC was a combination of the Building Officials and Code Administrators International, Inc. (BOCA), the International Conference of Building Officials (ICBO), and the Southern Building Code Congress International, Inc. (SBCCI).

The International Building Code is the standard building code typically used as a basis of design for a local jurisdiction to modify and adopt partially or as a whole. The code provides a standard consistent guideline for construction for all to adhere to as the minimum standard.

FINISHES

Hinges and pivots are available in just about every standard architectural hardware finish, from non-lacquered raw metal and primed for painting to satin chromium electro-plated and custom matched powder coat. Electro-plated clear coated/lacquered finishes are the most typically specified and installed, and can be manufactured as polished (a mirror finish look) or brushed (a textured brushed look).

ANSI and the BHMA publish ANSI/BHMA A156.18 American National Standard for Materials and Finishes, 2006, and they refer to three finish designation systems: The National Bureau of Standards of the U.S. Department of Commerce (U.S.), Canadian (C), and Builders Hardware Manufacturers Association (BHMA). The BHMA finish designations give us more information in their number by not only telling us what the finish of the item is, but also including the base metal that was used to manufacture the product. This is important when specifying fire rated openings, so that we have a steel-based metal as required by NFPA 80. Any other base metal, such as brass or bronze, would melt long before the time required by code, leaving the door vulnerable to fire hazard.

For example, US26D is the U.S. designation for Satin Chromium Plated, while 626 is the BHMA designation for Satin Chromium Plated on Brass or Bronze base metal, and 652 is the BHMA designation for Satin Chromium Plated on Steel base metal. This is important to know when specifying, ordering, and installing hinges on fire rated doors, as they require steel-based hinges per NFPA 80 (see Standards—NFPA 80).

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FIGURE I.1. Tables of Finish Descriptions and Equivalents, A156.18-2012 (continues)

BHMA CODE NUMBER	FINSH DESCRIPTION	BASE MATERIAL	CATEGORY	NEAREST FORMER US EQUIVALENT
	Primed for Painting			
600	Primed for painting	Steel	D	USP
674	Primed for painting	Zinc	D	USP
715	Primed for painting	Aluminum	D	USP
	Bright Japanned			
601	Bright Japanned	Steel	D	US1B
	Zinc Plated			
603	Zinc plated	Steel	D	US2G
604	Zinc plated and dichromate sealed	Steel	D	
663	Zinc plated with clear chromate seal	Steel	D	
	Bright Brass			
605	Bright Brass, clear coated	Brass	A	US3
632	Bright brass plated, clear coated	Steel	E	US3
666	Bright brass plated, clear coated	Aluminum	E	US3
677	Bright brass plated, clear coated	Zinc	E	US3
697	Bright brass plated, clear coated	Plastic	E	US3
707	Bright brass anodized	Aluminum	E	US3
716	Bright gold anodized	Aluminum	E	US3
721	Bright brass uncoated	Architectural Bronze	B	US3
723	Bright brass appearance vacuum applied	Brass/Bronze	E	US3
724	Bright brass appearance vacuum applied	300 Series Stainless Steel	E	US3
729	Bright brass appearance vacuum applied	Zinc	E	US3
	Satin Brass			
606	Satin brass, clear coated	Brass	A	US4
633	Satin brass plated, clear coated	Steel	E	US4
667	Satin brass plated, clear coated	Aluminum	E	US4
678	Satin brass plated, clear coated	Zinc	E	US4
696	Satin brass painted	Any	E	US4
688	Satin aluminum, gold anodized	Aluminum	E	US4
698	Satin brass plated, clear coated	Plastic	E	US4
720	Mill finish brass uncoated	Architectural Bronze	B	US4
728	Satin brass uncoated	Architectural Bronze	B	US4
730	Satin brass appearance vacuum applied	Brass/Bronze	E	US4
731	Satin brass appearance vacuum applied	300 Series Stainless Steel	E	US4
732	Satin brass appearance vacuum applied	Zinc	E	US4
	Oxidized Satin Brass			
607	Oxidized satin brass, oiled rubbed	Brass	B	
634	Oxidized satin brass plated, oil rubbed	Steel	E	
683	Oxidized satin brass plated, oil rubbed	Zinc	E	
733	Oxidized Satin brass appearance vacuum applied	Brass/Bronze	E	US4
734	Oxidized Satin brass appearance vacuum applied	300 Series Stainless Steel	E	US4
735	Oxidized Satin brass appearance vacuum applied	Zinc	E	US4
	Oxidized Satin Brass, Relieved			
608	Oxidized satin brass, relieved, clear coated	Brass	C	
635	Oxidized satin brass plated, relieved, clear coated	Steel	E	

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FIGURE I.1. Tables of Finish Descriptions and Equivalents, A156.18-2012 (continues)

BHMA CODE NUMBER	FINSH DESCRIPTION	BASE MATERIAL	CATEGORY	NEAREST FORMER US EQUIVALENT
	Satin Brass, Blackened, Satin Relieved			
609	Satin brass, blackened, satin relieved, clear coated	Brass	C	US5
638	Satin brass plated, blackened, satin relieved, clear coated	Steel	E	US5
	Satin Brass, Blackened, Bright Relieved			
610	Satin brass, blackened, bright relieved, clear coated	Brass	C	US7
636	Satin brass plated, blackened bright relieved, clear coated	Steel	E	US7
	Bright Bronze			
611	Bright bronze, clear coated	Bronze	A	US9
637	Bright bronze plated, clear coated	Steel	E	US9
679	Bright bronze plated, clear coated	Zinc	E	US9
705	Bright bronze plated, clear coated	Aluminum	E	US9
708	Bright bronze anodized	Aluminum	E	US9
726	Bright bronze plated, clear coated	Brass	E	US9
736	Bright bronze appearance vacuum applied	Brass/Bronze	E	US9
737	Bright bronze appearance vacuum applied	300 Series Stainless Steel	E	US9
738	Bright bronze appearance vacuum applied	Zinc	E	US9
	Satin Bronze			
612	Satin bronze, clear coated	Bronze	A	US10
639	Satin bronze plated, clear coated	Steel	E	US10
668	Satin bronze plated, clear coated	Aluminum	E	US10
680	Satin bronze plated, clear coated	Zinc	E	US10
694	Medium bronze painted	Any	A	
699	Satin bronze plated, clear coated	Plastic	E	US10
709	Satin bronze anodized	Aluminum	E	US10
725	Satin bronze plated, clear coated	Brass	E	US10
739	Satin bronze appearance vacuum applied	Brass/Bronze	E	US10
740	Satin bronze appearance vacuum applied	300 Series Stainless Steel	E	US10
741	Satin bronze appearance vacuum applied	Zinc	E	US10
	Dark Oxidized Satin Bronze			
613	Dark oxidized satin bronze, oil rubbed	Bronze	B	US10B
640	Oxidized satin bronze plated over copper plate, oil rubbed	Steel	E	US10B
695	Dark bronze painted	Any	A	
703	Oxidized satin bronze plated, oil rubbed	Aluminum	E	US10B
704	Oxidized satin bronze plated, oil rubbed	Zinc	E	US10B
710	Dark oxidized satin bronze anodized	Aluminum	E	US10B
727	Dark oxidized Satin bronze plated	Brass	E	US10B
742	Dark oxidized Satin bronze appearance vacuum applied	Brass/Bronze	E	US10B
743	Dark oxidized Satin bronze appearance vacuum applied	300 Series Stainless Steel	E	US10B
744	Dark oxidized Satin bronze appearance vacuum applied	Zinc	E	US10B
	Oxidized Satin Bronze, Relieved			
614	Oxidized satin bronze, relieved clear coated	Bronze	C	
615	Oxidized satin bronze, relieved, waxed	Bronze	C	
641	Oxidized satin bronze plated, relieved, clear coated	Steel	E	
642	Oxidized satin bronze plated, relieved, waxed	Steel	E	

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FIGURE I.1. Tables of Finish Descriptions and Equivalents, A156.18-2012 (continues)

BHMA CODE NUMBER	FINSH DESCRIPTION	BASE MATERIAL	CATEGORY	NEAREST FORMER US EQUIVALENT
	Satin Bronze, Blackened			
616	Satin bronze, blackened, satin relieved, clear coated	Bronze	C	US11
643	Satin bronze plated, blackened satin relieved, clear coated	Steel	E	US11
	Dark Oxidized Satin Bronze, Bright Relieved			
617	Dark oxidized satin bronze, bright relieved, clear coated	Bronze	C	US13
644	Dark oxidized satin bronze plated, bright relieved, clear coated	Steel	E	US13
	Bright Nickel			
618	Bright nickel plated, clear coated	Brass, Bronze	A	US14
645	Bright nickel plated, clear coated	Steel	E	US14
669	Bright nickel plated	Aluminum	E	US14
745	Bright nickel appearance vacuum applied	Brass/Bronze	E	US14
746	Bright nickel appearance vacuum applied	300 Series Stainless Steel	E	US14
747	Bright nickel appearance vacuum applied	Zinc	E	US14
	Satin Nickel			
619	Satin nickel plated, clear coated	Brass, Bronze	A	US15
646	Satin nickel plated, clear coated	Steel	E	US15
670	Satin nickel plated	Aluminum	E	US15
748	Satin nickel appearance vacuum applied	Brass/Bronze	E	US15
749	Satin nickel appearance vacuum applied	300 Series Stainless Steel	E	US15
750	Satin nickel appearance vacuum applied	Zinc	E	US15
	Satin Nickel Plated, Blackened			
620	Satin nickel plated, blackened, satin relieved, clear coated	Brass, Bronze	C	US15A
647	Satin nickel plated, blackened, satin relieved, clear coated	Steel	E	US15A
	Nickel Plated, Blackened, Relieved			
621	Nickel plated, blackened, relieved clear coated	Brass, Bronze	C	US17A
648	Nickel plated, blackened, relieved, clear coated	Steel	E	US17A
	Flat Black Coated			
622	Flat black coated	Brass, Bronze	A	US19
631	Flat black coated	Steel	E	US19
671	Flat black coated	Aluminum	E	US19
676	Flat black coated	Zinc	E	US19
693	Black painted	Any	A	
711	Flat black anodized	Aluminum	E	US19
	Light Oxidized Statuary Bronze			
623	Light oxidized statuary bronze, clear coated	Bronze	C	US20
649	Light oxidized bright (statuary?) bronze plated, clear coated	Steel	E	US20
691	Light bronze painted	Any	E	US20
	Dark Oxidized Statuary Bronze	Bronze	C	US20A
624	Dark oxidized statuary bronze, clear coated	Bronze	C	US20
650	Dark oxidized statuary bronze plated, clear coated	Steel	E	US20A
690	Dark bronze painted	Any	E	US20A

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FIGURE I.1. Tables of Finish Descriptions and Equivalents, A156.18-2012 (continues)

BHMA CODE NUMBER	FINSH DESCRIPTION	BASE MATERIAL	CATEGORY	NEAREST FORMER US EQUIVALENT
	Bright Chromium			
625	Bright chromium plated over nickel	Brass, Bronze	A	US26
651	Bright chromium plated over nickel	Steel	E	US26
672	Bright chromium plated over nickel	Aluminum	E	US26
681	Bright chromium plated over nickel	Zinc	E	US26
700	Bright chromium plated over nickel	Plastic	E	US26
712	Bright chromium anodized	Aluminum	E	US26
717	Bright aluminum uncoated	Aluminum	B	US26
	Satin Chromium			
626	Satin chromium plated over nickel	Brass, Bronze	A	US26D
652	Satin chromium plated over nickel	Steel	E	US26D
682	Satin chromium plated over nickel	Zinc	E	US26D
701	Satin chromium plated over nickel	Plastic	E	US26D
702	Satin chromium plated over nickel	Aluminum	E	US26D
713	Satin chromium anodized	Aluminum	E	US26D
	Satin Aluminum			
627	Satin aluminum, clear coated	Aluminum	A	US27
628	Satin aluminum, clear anodized	Aluminum	A	US28
673	Aluminum clear coated	Aluminum	D	
689	Aluminum painted	Any	E	US28
718	Satin aluminum uncoated	Aluminum	B	US27
719	Mill finish aluminum uncoated	Aluminum	B	US27
	Bright Stainless Steel			
629	Bright stainless steel	Stainless steel 300 series	A	US32
653	Bright stainless steel plated	Stainless steel 400 series	E	US32
	Satin Stainless Steel			
630	Satin stainless steel	Stainless steel 300 series	A	US32D
654	Satin stainless steel plated	Stainless steel 400 series	E	US32D
	Other Combinations			
655	Light oxidized satin bronze, bright relieved, clear coated	Bronze	C	US13
656	Light oxidized satin bronze plated, bright relieved, clear coated	Steel	E	US13
657	Dark oxidized copper plated, satin relieved, clear coated	Steel	C	
658	Dark oxidized copper plated, bright relieved, clear coated	Steel	C	
659	Light oxidized copper plated, satin relieved, clear coated	Steel	C	
660	Light oxidized copper plated, bright relieved, clear coated	Steel	C	
661	Oxidized satin copper plated, relieved, clear coated	Steel	C	
662	Satin brass plated, browned satin relieved, clear coated	Steel	C	
664	Cadmium plated with clear chromate seal	Steel	D	
665	Cadmium plated with iridescent dichromate	Steel	D	
675	Dichromate sealed	Zinc	D	
684	Black chrome plated, bright	Brass, Bronze	C	
685	Black chrome plated, satin	Brass, Bronze	C	
686	Black chrome plated, bright	Steel	E	

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FIGURE I.1. Tables of Finish Descriptions and Equivalents, A156.18-2012

BHMA CODE NUMBER	FINSH DESCRIPTION	BASE MATERIAL	CATEGORY	NEAREST FORMER US EQUIVALENT
687	Black chrome plated, satin	Steel	E	
692	Tan painted	Any	D	
706	Gold painted	Any	D	
714	White painted	Aluminum	D	
722	Dark oxidized bronze oil rubbed	Architectural Bronze	B	US10A

* Vacuum applied finishes are generally applied over stainless steel base, or a chrome substrate on various base materials

(Source: Copyright © 2012 by the Builders Hardware Manufacturers Association, Inc.)

GRADES

Most hardware devices are tested to meet multiple minimum criteria, and depending on the levels met, grades are applied. Grade 1 is the best-performing device passing the highest minimum standards, grade 2 is the next, and grade 3 is the lowest quality of the three.

Testing includes cycle testing, which is the performance of how many times a device can be "used." For example, one cycle of a test would include a lever handle of a lockset being rotated to retract and extend a latchbolt. Another example is a door closer cycle; each time the door closer opens and closes is one cycle. Other tests include impact, where the devices are struck; weather or salt tests, where the devices are exposed to outdoor weather to see how long they will last, and the finish test to see how long the architectural finish on the device will resist wear and the test of time.

HANDING

Although many door hardware devices are not handed, there are many devices that are. Handing a device is determined by which way a door swings. A door hanging on the left and pushing away from you is a left-hand door and a door, hanging on the right and pushing away from you is a right-hand door. Reverse handed doors are the opposite, when a door is hanging on the left and pulls toward you, it is a left-hand reverse, and a door hanging on the right and pulling toward you is a right-hand reverse door.

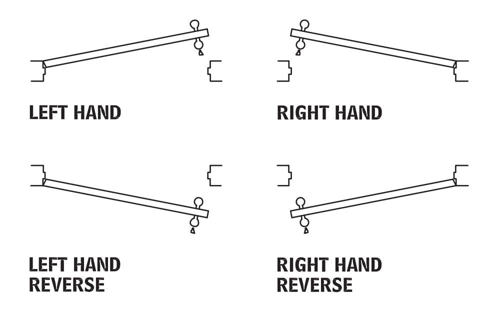


FIGURE I.2 Hands of Doors

(Source: The Graphics Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)

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MATERIALS

CAST

A cast hardware device or component has typically been manufactured by melting metal or combinations of metals to form a liquid, then pouring the liquid into a mold to create the device. Once the liquid cools, it creates a new solid object.

FORGED

A forged hardware device or component has typically been manufactured similarly to a wrought device by starting with a cast, then shaping the metal into either another object or a different shape than the original. The difference between forged and wrought is that a wrought object is formed or rolled into its new shape while a forged object is hammered into shape, which causes the steel to become harder than wrought and less likely to crack when struck or striking another object. Forging can be done at different temperatures and is known by its type, for example, cold forging, warm forging, or hot forging.

STAMPED

A stamped hardware device or component has typically been manufactured by punching or stamping an object, usually metal, in order to bend, remove, or emboss the original object into another object or different shape than the original. The process might take place with one object or device or multiple objects that are then attached to create the end result.

WROUGHT

A wrought hardware device or component has typically been manufactured similarly to a forged device by starting with a cast, then shaping the metal into either another object or different shape from the original. The difference between wrought and forged is the fact that forged is hammered into shape, which causes the steel to become harder than wrought and less likely to crack when struck or striking another object, while wrought is formed or rolled into its new shape.

FIRE RATING

LABELS

Doors and Frames are typically installed into walls of a structure. Depending on the structure's type, size, and occupancy, various fire rated walls are required to compartmentalize the structure so that fire does not spread through the entire structure without some type of protection to stop it from spreading from one area to another.

As such, doors, frames, and hardware must also carry a fire rating also known as a fire label. These ratings are typically matched to the wall and ceiling ratings so that they have the same resistance as the surrounding elements. Labels are different than listings; see Listings in this section.

Although doors must have a label to match a specific time frame as the walls do, such as a 3-hour or 45-minute rating, frames and hardware are required to be fire rated in general. Following are the most common fire door ratings:

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A

An "A" label door, also known as a three-hour (3-hour) rated door, has been tested to withstand a fire from penetrating or moving from one side of the door to the other, if closed and latched properly, for a minimum of three hours. As of today, only metal doors can be manufactured to meet this rating.

B

A "B" label door, also known as a one-and-a-half hour (1-1/2-hour) rated door has been tested to keep a fire from penetrating or moving from one side of the door to the other, if closed and latched properly, for a minimum of one-and-one-half hours.

C

A "C" label door, also known as a 45-minute rated door, has been tested to keep a fire from penetrating or moving from one side of the door to the other, if closed and latched properly, for a minimum of 45 minutes.

20 Minute

Twenty-minute (20-minute) doors were most typically used in corridors of educational facilities, but in current construction of these types of facilities, at a minimum 45-minute-rated doors are more typically required.

Smoke

Some fire rated doors require a Smoke (S) rating in addition or in lieu of a fire rating, depending on the construction, facility, and code type. This type of opening would prohibit or limit the amount of smoke being transferred from one side of the opening to the other.

LISTING

A hardware device most typically has a listing, which is usually governed and applied by the Underwriters Laboratories (UL), (see UL under Standards earlier in this Introduction.) The listing requires certain devices to operate in a certain manner for certain applications; one example is panic hardware on egress doors being required in places of occupancy by more than 50 people at a time.

SPECIFICATIONS

Specifications can be written many different ways using many different methods, and there can be many right answers. Following are some specification types, methods, and mediums by which a project can be specified.

FORMATS

The Construction Specifications Institute (CSI) developed and continues to maintain various documentation standards that are used by the architect to create project specification documents to complement the drawings or visual representation of the drawings. A typical specification is created in three-part format, either in MasterFormat® 95 or 2004, and can be written as proprietary, open, or ANSI, and in a 2D or 3D medium.

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PageFormat

PageFormat is a standard arrangement of information through consistent numbering in each division, in each section, and on each page of a specification manual. For example, each section starts with PART 1—GENERAL, 1.1 Summary, A. Section Includes or relevant instructions, and ends with PART 2—EXECUTION, 3.3 Adjusting or the relevant instructions.

MasterFormat®

MasterFormat® is a standard that uses a unique numbering system to organize information for building projects. This format went through a major update in 2004, referred to as MasterFormat® 2004, and receives updates every couple of years. Although created long before with many updates since, the version prior to 2004 is typically referred to as MasterFormat® 95.

95

MasterFormat® 95 is a 16 Division format with five-number sections. For example, door hardware is located in Division 8, Section 08700, and is named Hardware. Within this division and section, there are other formats used to create consistent page layout and references, known as OmniClass™, PageFormat.

2004

MasterFormat® 2004 is a 50-division format with six-number sections. For example, door hardware is located in Division 08, Section 08 71 00, and is named Door Hardware. Within this division and section, there are other formats used to create consistent page layout and references, known as OmniClass™, PageFormat. MasterFormat® 2004 allows for all of the technological and product advancements made over the years, and now has a place for them to be specified, whereas in the older versions some of these newer products had to be specified in sections where they did not belong, or in what was known as the Phantom Division 17, which was created randomly by various firms or entities to have a place for items that did not have a place of their own.

Three Parts

Each specification document section typically has three parts in order to categorize the data consistently throughout the project specification documents; this way the data is in the same area each time you look, no matter what type of product or process you are looking at. Specifications for any products or processes should be specified once, in one place, and should be clear, correct, concise, and complete. Repetition can lead to conflicts, varying interpretations, and errors.

PART 1

Part 1 General typically describes the general requirements of a project, including the procedures, administration, and any requirements specific to the section written. Part 1 also typically refers back to and clarifies any Division 01 requirements such as substitution requests.

PART 2

Part 2 Products typically describes the products, including any materials and equipment that is required for the project. Part 2 also typically describes any specific manufacturers, product numbers, finishes, and functions required for the project as a whole or specific to an opening type. Most product types require at least three equal products of the same type, grade, and function specified to allow for competitive bidding and the best value for the owner.

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PART 3

Part 3 Execution typically describes the various applications and installations, including any pre- or postconstruction cleaning, protection, and anything to do with onsite fabrication.

UniFormat™

UniFormat™ is a classification system for organizing construction information during the preliminary stages of design. By starting out with a standard format, it is easier and more intuitive to create the construction specifications from this early project document.

MEDIA

Door hardware specifications can be written in various media, but the most prominent approaches are 2D or 3D.

2D

2D specifications are written conventionally in some type of word processor format. This can be done "long hand" in a word processing program or via door hardware specification or submittal-writing software that exports the data to a 2D word processing document.

3D

3D specification is a newer medium to create the information required. This information is an add-on to the overall design software and allows the 3D data, known as door libraries, to be exported out of the 3D software and models. Once the data is extracted, it can be manipulated, incorporated with details and data specific to that project, opening, function, and surrounding conditions, and then be imported back into the 3D environment or model as one of the contributing objects to the whole.

TYPES

Descriptive

Descriptive specifications are written as a detailed description of the requirements of the specific type of hardware. This includes the material, function, finish, and application. Descriptive specifications do not use manufacturers' names or model numbers.

Nonrestrictive

Nonrestrictive specifications are written specifically to prohibit proprietary specifications and to allow competitive bidding and the best value for the owner's money. Nonrestrictive specifications can be written in descriptive, performance, or reference standard format, as long as more than one manufacturer can meet those requirements.

Performance

Performance specifications are written as a detailed requirement of the end results without specific material and processes being described. This allows for any methods or means as long as the required end results are achieved. This can be both good and risky, and new types of products or means might be created to achieve these results, giving something new and not seen or used before. At the same

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time, employing something not used before means it has no track record of performance, just the testing required to meet the standards specified.

Proprietary

Proprietary specifications are written with a specific manufacturer, brand, and model number without any other manufacturers or products allowed. This might be the case when an existing facility, say a healthcare campus, has their standards, stock of the components for any nonfunctioning hardware, and the training to fix it. This makes it easier than starting a new wing of a hospital with brand-new hardware manufacturers and types of hardware to learn and maintain. Proprietary specifications and projects are typically only allowed when the money or owner funding the project is private and not public. By specifying proprietary items, the owner will likely pay more for the items as there is no competition during the bidding stage—the hardware required is single source, so the supplier can charge a bit more than for something being competitively bid.

Reference Standard

Reference standard specifications are written with a specific type or function in mind, but not necessarily a specific aesthetic or manufacturer. Door hardware reference standard specifications would be written around American National Standard Institute/Builders Hardware Manufacturer's Association (ANSI/BHMA) standards.

STANDARDS

A standard is enforceable when an Authority Having Jurisdiction (AHJ), a local, federal, or other entity having jurisdiction over law, adopts the standard as a whole itself, or references the standard in another adopted law, such as a state building code. The most commonly referenced standard in just about every building code is National Fire Protection Association (NFPA) 80, Standard for Fire Doors and Other Opening Protectives, 2010, or the most current version (see Standards, Fire/Smoke). Some standards are updated on a consistent cycle, typically every three years (NFPA 80, 2007, was the version prior to 2010 and 2013 will be the next version).

Standards are typically referred to as the minimum standard and are not always that impressive when it comes to cycle, grade, or any other minimum requirement. That said, although there are minimum standards, there are some manufacturers, products, and solutions that go above and beyond these minimums, some at the same or minimal additional cost, so do your research and rely on true consultants who can offer opinions on any and all products and solutions. These types of products not only offer better value for cost, but also offer other positive aspects to the owner and environment by being a sustainable solution, for example, having to replace a mortise lock after 15 million cycles instead of the typical minimum standard of 1 million, which both meet the minimum standard.

ACCESSIBILITY

The Americans with Disabilities Act (ADA) was created to set guidelines for accessibility to places of public accommodation and commercial facilities by individuals with disabilities. These guidelines are to be applied during the design, construction, and alteration of such buildings and facilities to the extent required by regulations issued by federal agencies, including the Department of Justice, under the Americans with Disabilities Act of 1990.

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ADAAG—The Americans with Disabilities Act Accessibility Guidelines

The Americans with Disabilities Act (ADA) is a landmark law that protects the civil rights of persons with disabilities. ADAAG serves as the basis for standards used to enforce the design requirements of the ADA. These standards are maintained by the U.S. Department of Justice (DOJ) and the U.S. Department of Transportation (DOT).

ICC/A117.1 Accessible and Usable Buildings and Facilities

ICC/A117.1 is available for adoption and use by jurisdictions internationally. Its use within a government jurisdiction is intended to be accomplished through adoption by reference in accordance with proceedings establishing the jurisdiction's laws.

International Green Construction Code (IGCC)

The International Green Construction Code (IGCC) is published by the International Code Council (ICC), which was formed in 1994 as a nonprofit organization dedicated to developing a single set of comprehensive and coordinated national model construction codes. The ICC was a combination of the Building Officials and Code Administrators International, Inc. (BOCA), the International Conference of Building Officials (ICBO), and the Southern Building Code Congress International, Inc. (SBCCI).

NFPA 1, Fire Code

Although NFPA created and maintains their own fire code, it is not widely used or adopted, where the preferred code is from the International Code Council (ICC).

NFPA 70, National Electric Code

Adopted in all 50 states, NFPA 70 is the standard for safe electrical design, installation, and inspection to protect people and property from electrical hazards. Please refer to the most recent version of NFPA 70 for current and complete information.

NFPA 80, Standard for Fire Doors and Other Opening Protectives

NFPA 80 regulates the installation and maintenance of assemblies and devices used to protect openings in walls, floors, and ceilings against the spread of fire and smoke within, into, or out of buildings. Please refer to the most recent version of NFPA 80 for current and complete information.

ASTM INTERNATIONAL

(Formerly Known as the American Society for Testing and Materials)

A globally recognized leader in the development and delivery of international voluntary consensus standards that works in an open and transparent process and using ASTM's advanced electronic infrastructure, ASTM members deliver the test methods, specifications, guidelines, and practices that support industries and governments worldwide.

UNDERWRITERS LABORATORY (UL)

Underwriters Laboratory (UL) is an independent safety company innovating solutions for many of the items that we use every day, from electricity to sustainability and renewable energy. UL is dedicated to testing safe environments to help safeguard people. There are many UL standards that affect doors and door hardware.

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SUBMITTALS

Hardware schedules, also known as submittals, are typically created from architectural project specifications and drawings, which are created by an architect. Hardware schedules are created from the specifications typically by a door and hardware distributor employee. The schedule is typically submitted to the project general contractor or construction manager, who submits it to the project architect for approval prior to ordering and delivering to the jobsite.

While a vertical schedule is typically specified and preferred by an architect, this standard describes both horizontal and vertical formats. Project specifications typically specify that hardware schedules are required to be created by a certified Architectural Hardware Consultant (AHC), who is certified by DHI.

SUBSTITUTIONS

If product substitution requests are allowed from what was originally specified, the request process is typically specified in Division 01 of the project manual, otherwise known as the specifications. The substitution request requirements are typically asking for product data and proof that the requested substitution will meet the same grade, function, application, aesthetic, and quality of the originally specified product. It is recommended that all substitution requests be submitted within the procedures as outlined in Division 1, Section 01 25 13 Product Substitution, and on Construction Specifications Institute (CSI) Substitution Request Forms.

As mentioned in the Standards section earlier in this Introduction, be cautious of what is considered an equal as standards refer to the minimum standard, but there are some manufacturers, products, and solutions that go above and beyond these minimums.

It is recommended that substitution requests and approvals not be taken lightly as sometimes the substitution is proposed or taking place to strictly save money or to become more competitive on a bid to win the project contract to supply the door hardware. Although it is not always the case where you get what you pay for, it is typically the case with door hardware. If you are saving money on an item, it is likely that the item is not of the same standards and quality as the originally specified device. The quality substitution can be one of a few types, for example, furnishing a hinge with a cheaper-quality finish or rough edges as compared to a better-quality finish and square flush edges.

SUSTAINABILITY

Some manufacturers contribute to sustainability with the way they source materials, manufacture products, and run and maintain factories and offices. There are new practices taking place known as Health Product Declarations (HPD) and Environmental Product Declarations (EPD). These new practices provide transparent information about products, which include their materials and effects on the living beings who are in contact with the items. HPDs and EPDs are almost like the cereal box labels that list the ingredients of products and their health effects. A life-cycle analysis is also becoming a common practice, giving the product an expected lifespan of use.

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HANGING DEVICES

As discussed in the Introduction, the first type of device addressed in the Door and Hardware Institute's Sequence and Format for the Hardware Schedule is the hanging device. Although not typically a highlight of the door opening, the hanging device is one of the most important components. Supporting the entire weight of the door from the top, bottom, side, or a combination, the hanging device is relied on for its precise and consistent pivot point swing or slide, and is probably the most actively used door opening component.

Depending on the type of door, its function, and application, doors can be hung onto a door frame, onto a framed opening, or directly on a wall. A swinging door can be hung on hinges, continuous hinges, pivots, or floor closers, while a sliding door can be hung on tracks and hangers suspended from the top underneath the head of a framed opening, on the face of the wall, or supported by the floor from underneath the door. The most efficient and effective way to hang a door would be any means supported by the floor rather than the frame or wall. This creates less or no tension on the frame or wall where the door by nature is pulling away, whereas a door supported by the floor is resting on top and has no tension at all.

Although a swinging door is the most common type, sliding door options and use have increased over recent years because of their functionality, space-saving ability, and aesthetics.

HINGES

Also Known As: Butts, Butt Hinges, Standard Hinges

DESCRIPTION

Hinges are manufactured to accommodate various door sizes, thicknesses, weights, new and existing conditions, and fire ratings. Special hinge applications are available for specific situations, which include healthcare and those that have particular aesthetic needs, sound requirements, or door and frame applied materials.

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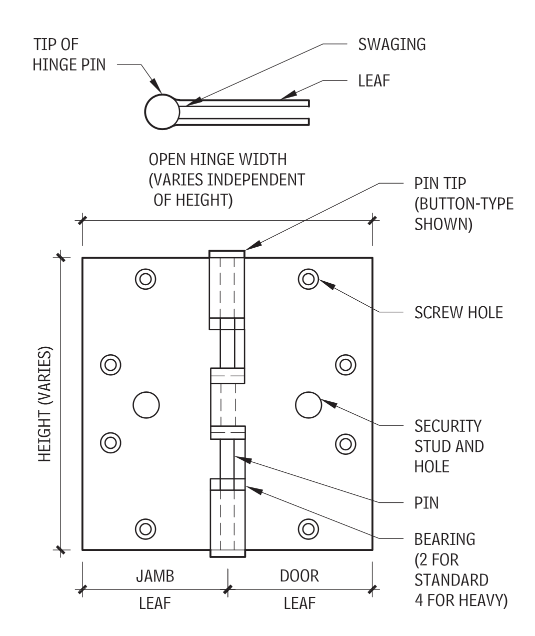


FIGURE 1.1 Elements of a Hinge

(Source: The Graphic Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)

PROPERTIES

Hinges are typically manufactured with two leaves that have alternating knuckles, which meet to form a barrel, and a hinge pin holds the leaves together as one. This gives a hinge the ability to rotate or swing a door into the open or closed position.

A hinge pin typically has a flat tipped end so that it rests against the top of the hinge barrel so that the pin does not fall through. With that said, although most commercial hinges are manufactured with pins that are "nonrising," they still have the ability to rise if nothing is holding them in place as a nonremovable pin option (see Nonremovable Pin in the hinge options section of this chapter). Other pin options are what are known as fast pins, which are more difficult to remove in the field as they are either riveted or threaded into the barrel, similar to the way a screw is with threads. This type of pin might be most desirable on out-swinging, or reverse bevel, doors so that the pins cannot be easily removed, the door taken off its hinges, and the opening left unsecure.

Although the majority of barrels are round, some manufacturers offer square barrel hinges for a different aesthetic. Screw holes are typically countersunk, unless one is using a special hinge type such as the slip-in hinge (see Slip-In under Types in this section).

Bearings

Also known as anti-friction bearings, these are hinges that are manufactured with bearings separate the metal of the knuckles, keeping them from directly touching and pivoting on each other. The inserts, which can be plastic, ball bearings or oil-impregnated bearings, create a barrier between the metal parts, eliminating metal friction, which causes less wear on the knuckles than a nonbearing hinge would.

BALL BEARING

Ball bearing hinges are manufactured with a metal ring inserted in between each knuckle of the barrel with ball bearings inside each ring, very similar to the wheels of roller skates, which help them roll more smoothly and with less friction. Most commonly, the ball bearing rings are visible, creating additional shear lines in the appearance.

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FIGURE 1.2 Heavyweight Ball Bearing Full Mortise Butt Hinge
(Source: Courtesy of McKinney® Products Company)

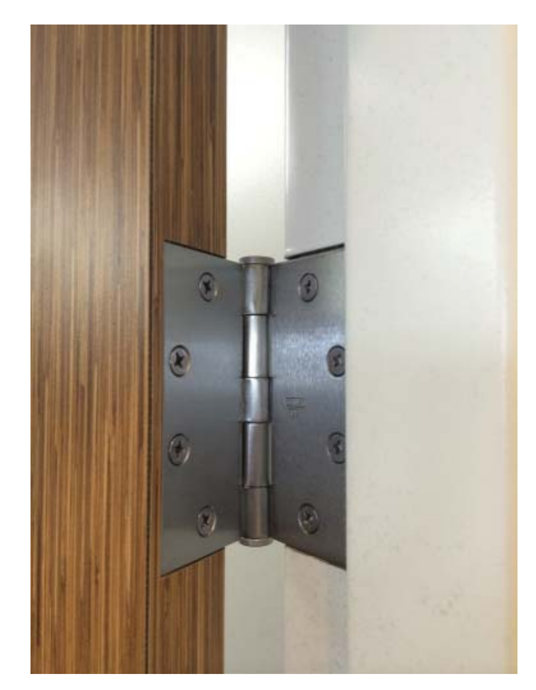


FIGURE 1.3 Nonbearing Full Mortise Butt Hinge
(Source: Courtesy of Scott J. Tobias)

Available as an option from some manufacturers are concealed bearing hinges, where the bearings are concealed in larger knuckles, which are visually similar to nonbearing butt hinges.

Standard weight hinges typically have two rings of ball bearings on the barrel whereas heavy weight hinges typically have four. Per building codes and standards, fire rated doors must be installed with butt hinges that have a minimum of two ball bearings.

NONBEARING

Nonbearing hinges allow the knuckles of the barrel to directly meet, pivoting on each other with nothing to prevent the metal from wearing excessively. This is more likely on frequently used door openings than on infrequently used ones, such as a closet or bedroom door in a home.

OIL-IMPREGNATED BEARING

Oil-impregnated bearing hinges are manufactured with a metal ring insert in between each pair of knuckle of the barrel with oil inside each ring instead of ball bearings. These rings of oil act similarly to ball bearings and protect the knuckles of the hinge barrel from touching each other directly, helping to reduce excessive wear.

Corners

ROUND CORNER

Some hinges are available with rounded corners as an option; these are typically used for residential doors and frames, although you may come across them on a commercial project or two. The round corner can either be a specific model number or an option to a model number allowing you to change the square edge to round.

SQUARE CORNER

Most hinges are manufactured standard with square edges with 90-degree corners. Be cautious when handling the hinge, the corner can be sharp at the point.

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FIGURE 1.4 Round Corner Hinge
(Source: Courtesy of McKinney® Products Company)



FIGURE 1.5 Square Corner Hinge
(Source: Courtesy of McKinney® Products Company)

Finishes

Depending on the manufacturer's availability, hinges are typically available in all architectural hardware finishes. Depending on the aesthetic and cost choices made, sometimes hinges are specified with plated or solid metal finishes to match the locking and/or other hardware on the opening. Prime-coated hinges are also available, which are less expensive than a plated finish and are typically painted the same color and at the same time as the door, frame, and surrounding areas.

Painting hinges or anything on site is not recommended as it will contribute to poor air quality for those currently and eventually working in the space. Using a manufacturer's factory finish might even help contribute to credits toward a current or future green building standard, code, or certification.

Grades

Although hinges are typically referred to in weights, ANSI/BHMA A156.1 American National Standard for Butts and Hinges have minimum standards and hinges are graded with various tests. Cycle testing, hinge pin rise, hinge play to test the movement of a fixed hinge, vertical and lateral wear, an electrical hinge test, and finish tests are the main tests. Cycle testing shows the following as minimum grade requirements for cycle testing:

- Grade 1: 2,500,000 cycles
- Grade 2: 1,500,000 cycles
- Grade 3: 350,000 cycles

Imagine getting a grade 3 product when specifying a grade 1 due to poor substitution practices. Be sure to check each item delivered against the approved specifications and submittals for compliance of quality.

Hole Preparations

NONTEMPLATED

Nontemplated hinges are manufactured without standard fastener hole locations and the holes can be at any location on the hinge leaves. These hinges tend to be less expensive and are typically used for residential applications.

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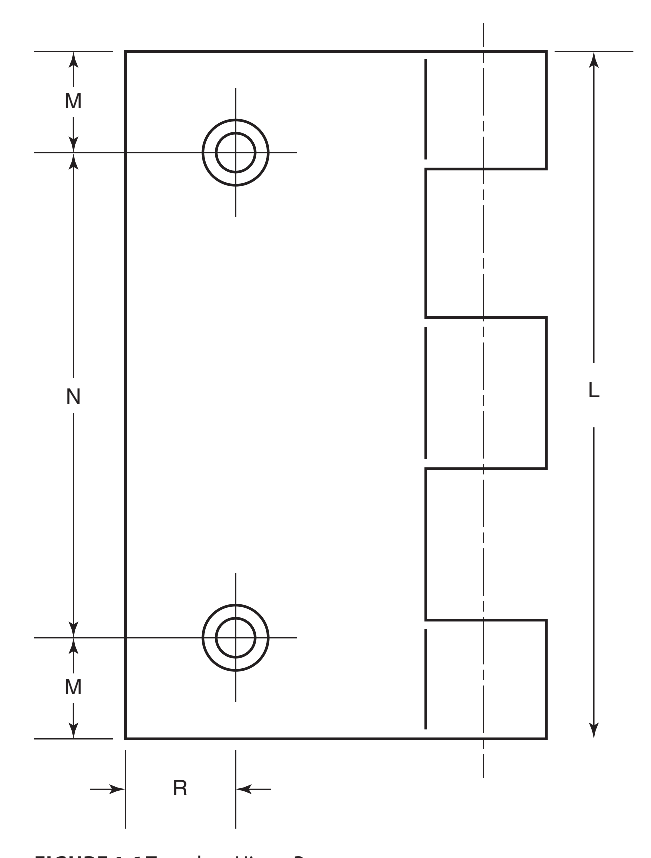


FIGURE 1.6 Template Hinge Pattern

(Source: ANSI/BHMA A156.7 American National Standard for Templated Hinge Dimensions, 2009, Builder's Hardware Manufacturer's Association)

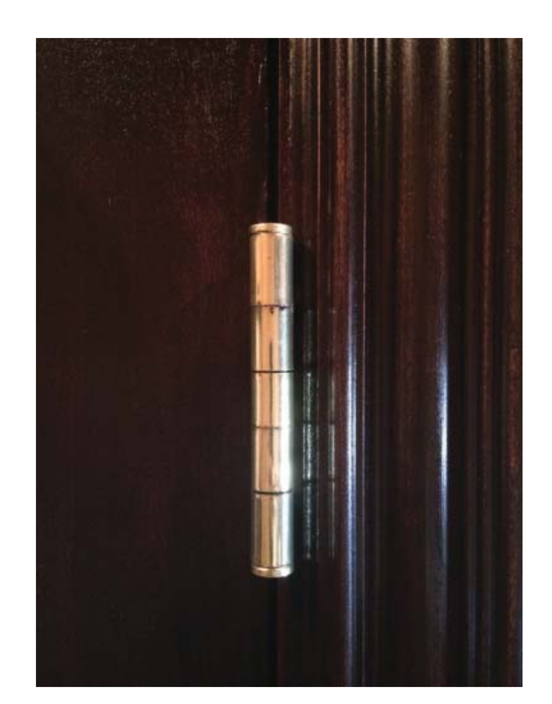


FIGURE 1.7 Five-Knuckle Hinge Barrel

(Source: Courtesy of Scott J. Tobias)

TEMPLATED

Templated hinges are manufactured with standard fastener hole locations on the hinge leaves. These standard locations are detailed in the ANSI/BHMA Standard A156.7–2003 for Template Hinge Dimensions. This standard is typically referenced in commercial construction projects specifications (see the Introduction of this book for more information on ANSI/BHMA).

Knuckles

Hinges can be manufactured with different knuckle quantities. The different knuckle quantities that form the barrel give the barrel different appearances.

FIVE-KNUCKLE HINGES

A hinge with five knuckles is typically the most widely used type of butt hinge. One leaf of the hinge has three knuckles and the other leaf has two, which fit together to form a barrel. The hinge barrel is held together by inserting a hinge pin down the center of the barrel from one end to the other.

THREE-KNUCKLE HINGES

Three-knuckle hinges are another widely used option, where one leaf has two knuckles, one each at the top and bottom ends of the leaf. The other leaf has one large knuckle in the center and, when pieced together with the other half, a three-knuckle hinge barrel is formed. The hinge barrel is held together by inserting a hinge pin down the center of the barrel from one end to the other.

TWO-KNUCKLE HINGES

Two-knuckle hinges are also referred to as Paumelle Hinges (see Paumelle Hinges in this section). A two-knuckle hinge with a conventional barrel will have a very streamlined clean look where there are

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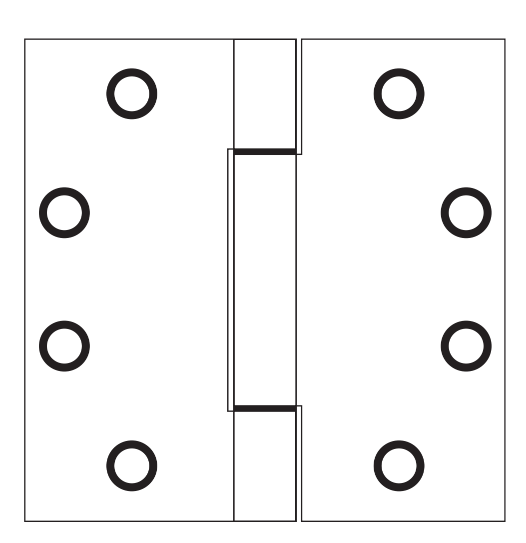


FIGURE 1.8 Three-Knuckle Hinge Diagram
(Source: Courtesy of McKinney® Products Company)



FIGURE 1.9 Two-Knuckle Hinge
(Source: Courtesy of Scott J. Tobias)

only two long "knuckles" forming the barrel. Typically, rather than a pin being inserted into the barrel, the bottom half of the leaf of the barrel has a pin attached to it protruding out of the barrel on one side. The top hinge leaf barrel is hollow and, with the help of gravity keeping the two leaves together to form the full barrel, the top leaf slips onto the pin of the bottom leaf.

Unlike five- and three-knuckle hinges, which can be used on any handed opening, left hand or right hand, two-knuckle hinges are handed and have to be specific to the door swing. It would be impossible to install a left-hand hinge on a right-hand door, as the pin would be sticking down instead of up with nothing to support the bottom leaf.

Materials

Hinges are manufactured from various materials including steel, brass, bronze, or stainless steel. The material type specified and installed can depend on the door opening application and fire rating requirements.

If a door opening is fire rated, the codes state that hanging devices must be manufactured of steel to withstand the high temperatures of a fire for a certain period of time, depending on the surrounding wall rating. If anything other than a steel base hinge is installed on a fire rated door opening and a fire occurs, the hinge metal might melt enough to cause the opening to fail, allowing the fire to spread from one side of the opening to the other prematurely.

When choosing a base metal, one should also take into account rusting. Brass and bronze base metal hinges will not rust at all, whereas steel hinges are prone to rust, and although stainless steel can rust, it is more resistant than steel.

Although you might see aluminum hinges on some light-duty doors, it is not optimal for door openings due to the softness of the metal. Aluminum does not rust as steel does, but it does oxidize and corrode, which gives the appearance of rusting without the rust color. Aluminum hinges are typically clear coated to help prevent the oxidation.

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Ratings

NONFIRE RATED

Nonfire rated hinges can only be used on doors and frames that are not fire rated openings. These hinges can be manufactured from brass or bronze base metals.

FIRE RATED

Fire rated hinges can be applied to both fire rated or nonfire rated doors and frames. These hinges can only be manufactured from steel or stainless steel base metals.

Sizes

The hinge size typically follows the model number, so once you have decided on the manufacturer, type, knuckle configuration, and bearing type, and the door size, material, and frequency; it is time to determine the proper hinge size.

The first number in the size of a hinge typically refers to the hinge height, while the second number refers to the hinge width. For a typical 1 3/4-inch-thick door, the hinge size would typically be 4 1/2 inches by 4 1/2 inches, which means the hinge leaves are 4 1/2 inches high and 4 1/2 inches wide with the hinge leaves in the open position.

For thicker doors and doors and/or frames with plant-on materials on the faces such as panels, thicker hinges might be required to clear the added materials. The calculation for figuring out the optimal hinge width is to deduct the backset (dimension between the edge of the door and the edge of the hinge leaf) of the hinge on the door from the door thickness, multiply the balance by 2, and add any additional clearances such as the thickness of an applied panel. The dimension might end up in the middle of a standard hinge size offering; if you come across this situation, round up to the next available size.

Swaging

Hinge leaves are typically swaged. Swaging is a slight offset of the hinge leaf at the barrel. The offset accounts for the door edge, which is typically beveled. A beveled door edge is typically required for swinging doors so that the door edge does not bind with the square edge of the frame. If both edges were square, the door would not fit into the frame.

Recommened Size of Hinges per Door, Either Wood or Metal

Door		Hinge	
Thickness In. (mm)	**Width In. (mm)**	**Height In. (mm)**	**Gauge**
1 3/8" (35)	up to 36" (914)	3 1/2" (89)	.123
1 3/8" (35)	over 36" (914)	4" (102)	.130
1 3/4" (44)	up to 36" (914)	4 1/2" (114)	.134
1 3/4" (44)	36 – 48" (914–1219)	5" (127)	.146
1 3/4" (44)	over 48" (1219)	6" (152)	.160
2" 2 1/2" (51–64)	up to 42" (1067)	5" (127)	.190
2" 2 1/2" (51–64)	over 42" (1067)	6" (152) HW	.203

FIGURE 1.10 Butt Hinge Size Chart
(Source: Courtesy of McKinney® Products Company)

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Door Weights per Square Foot
Based upon 3'0" x 7'0" Door Size

Hollow Metal Door Weights by Gauge

	Lbs. per Square Foot
20 Gauge	4
18 Gauge	5
16 Gauge	6
14 Gauge	7

FIGURE 1.11 Door Weight per Square Foot Chart
(Source: Courtesy of McKinney® Products Company)

Door Weights per Square Foot
Based upon 3'0" x 7'0" Door Size

Wood Door Weights by Door Thickness

	Lbs. per Square Foot	
	1 3/8" door	1 3/4" door
Particle/Mineral Core	4.75	5.25
Stave Core Wood	3.75	4.25
Hollow Core Wood	1.3	1.5

Door Weight Chart Butt Hinges

When in the parallel position, most hinge swaging provides a 1/16-inch clearance between the hinge leaves to accommodate for the door and frame clearance, which allows the door to swing in and out of the door frame without binding.

Weights

Although hinges are categorized in grades by ANSI/BHMA A156.1 American National Standard for Butts and Hinges, they are also referred to as weights—standard and heavy. The optimal hinge weight depends on the door's width, weight, and frequency of use, and there are industry, code, manufacturers' and standards charts to help guide us to the correct choice. In addition to weights, a hinge can be manufactured with different quality levels, depending on its source, factory, and sometimes the standards of the country in which it is manufactured.

Some manufacturers still manufacture hinges in the United States, which are typically of superior quality to those manufactured in some other countries, known in the industry as imports. Imports are available for the most typical and widely used sizes, namely, for 3-foot-wide, 7-foot-high, and 1 3/4-inch-thick wood or metal swinging doors. The hinges are less expensive than those still made in the United States and the lower quality can sometimes be noticed with ragged edges, poor finishes, and less than optimal performance.

Due to the competitive nature of the door opening industry, some of the U.S. manufacturers now sell similar hinges in quality and cost in order to compete on projects.

STANDARD WEIGHT

Standard weight hinges are manufactured with 0.134-inches-thick material and are typically specified and installed on the majority of commercial wood and metal doors and frames.

HEAVYWEIGHT

Heavyweight hinges are similar to standard-weight hinges in the manufacturing process and design, except they are manufactured at 0.180 inches in a thicker gauge metal and are more substantial than standard-weight hinges.

Heavyweight hinges are recommended for specification and installation on wider, thicker, and more frequently used door openings to help the door withstand the higher use and abuse it might encounter in its extensive use.

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Expected Frequency of Door Operation

Door	Expected Daily Cycles	Frequency Yearly	
Commercial			
Commercial Store Entrance	5,000	1,500,000	High
Office Building Entrance	4,000	1,200,000	
Theatre Entrance	1,000	450,000	
School Entrance	1,250	225,000	
School Restroom Door	1,250	225,000	
Store or Bank Entrance	500	150,000	
Office Building Restroom Door	400	118,000	
School Corridor Door	80	15,000	Average
Office Building Corridor Door	75	22,000	
Store Restroom Door	60	18,000	
Residential			
Entrance	40	15,000	Low
Restroom Door	25	9,000	
Corridor Door	10	3,600	
Closet Door	6	2,200	

FIGURE 1.12 Door Frequency of Use Chart
(Source: Courtesy of McKinney® Products Company)

TYPES

Anchor

Typically fully mortised and furnished in sets of three, an anchor hinge is manufactured similarly to a standard mortise hinge. The difference is that the top hinge of the set is manufactured with two flat metal plates with screw holes that rest flat on top of the door and against the head of the frame. The plates are screwed down and up in place, in a sense anchoring the hinge to the door and frame where the most tension, or pulling away from the frame, typically occurs.

Although not commonly used and a unique aesthetic where the hinge is installed at the very top of the edge of the door (instead of 5–1/2 inches to 7 inches down from the top of the door as with most standard hinges), the use of an anchor hinge could possibly help sustain an opening's lifespan by supporting some of the weight of the top of the door by being attached to the head of the frame instead of the top of the hinge jamb.

Blank Plate

Hinge blank plates are available to fit the preparation for a templated mortised hinge leaf, which might not be used anymore. A preparation might need to be filled with a blank if a door is removed from the opening altogether and no door will hang in the opening anymore or if the existing mortise preparation has weakened and is not sufficient to hold the weight of a door hung on the mortise hinge it was intended to. In this case, a hinge blank would fill the preparation and a surface-mounted hinge could hang the door instead.

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FIGURE 1.13 Anchor Hinge
(Source: Courtesy of McKinney® Products Company)



FIGURE 1.14 Hinge Blank Plate
(Source: Courtesy of Maddalena Messina)

Detention Hinge

Typically used on prison cell doors or very high security metal pass-through doors used in courthouses or other types of detention facilities. One would think that this would be the perfect place for a high-security fastener, when in fact these hinges are typically welded onto the surface or faces of the metal door and frame.

Friction

Friction hinges are used to hold a door open at any angle of the door swing. The friction is caused by bearings or discs manufactured into the knuckles, which that can be adjusted to create different friction levels.

Invisible Hinge

Unlike any conventional hinge and available from a limited number of manufacturers, invisible hinges are named just as they appear on the door and frame in the closed position, invisible. This gives the



FIGURE 1.15 Various Invisible Hinges
(Source: Soss Door Hardware)

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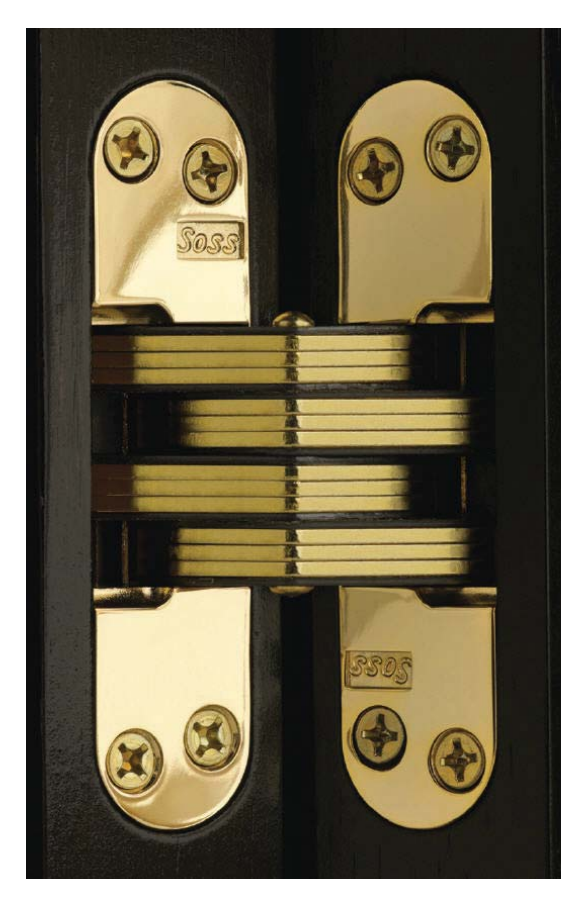


FIGURE 1.16 Invisible Hinge Open
(Source: Soss Door Hardware)



FIGURE 1.17 Invisible Hinge and Door Application
(Source: Soss Door Hardware)

appearance that there is no hinge installed at all and the hinge cannot be seen unless the door is in the open position. When in the open position, on the edge of the door and frame you can see the face of the hinge and the screws.

As with conventional hinges, there are various options available, depending on the door size and frequency of use, including spring and electric transfer hinge options. Although only visible when the door is in the open position and depending on the manufacturer, invisible hinges are available in most standard architectural hardware finishes.

Lightweight

Lightweight hinges are typically used for residential or very light-duty and frequently used door opening applications. Most lightweight hinges are not template are plain bearing, and have rounded corners.

Olive Knuckle

Typically fully mortised, olive knuckle hinges have a similar appearance to intermediate pivots with one knuckle in the center of the device. Oval in shape, resembling an olive, the knuckle joins the two leaves of the hinge together, and they are typically rated grade 2 by their manufacturers and are intended to be used on low-frequency, decorative, residential door openings such as interior French doors. The hinge leaves are typically narrow and might be able to carry less door weight than standard hinges with limited door size varieties.

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FIGURE 1.18 Olive Knuckle Hinge
(Source: Courtesy of McKinney® Products Company)

Paumelle Knuckle

Paumelle hinges are hinges that have one knuckle—whether round, rectangular, or olive in shape—where one center knuckle joins the two leaves of the hinge together with a pin sticking out of the bottom half. The top half rests on top of the bottom, with gravity keeping the two halves together. Paumelle knuckle hinges are typically used on low-frequency, decorative, residential door openings such as interior French doors, and the hinge leaves are typically narrow and able to carry less door weight and door size varieties than standard butt hinges.

Pivot Reinforced

Similar to an anchor hinge, a pivot reinforced hinge has two flat metal plates with screw holes that rest flat on top of the door and against the head of the frame. The plates are screwed down and up in place, in a sense anchoring the hinge to the door and frame where the most tension, or pulling away from the frame, typically occurs.

Raised Barrel

Typically, a full mortise hinge and used when a door is recessed in a reveal in a frame, the hinge barrel is offset to allow a door to swing on an offset pivot point. When a door is recessed in a frame, a standard full mortise hinge barrel would not sit flush against the frame and door leaving a gap and an incorrect, inefficient butt hinge installation causing the door and frame to bind. By offsetting the hinge barrel, the hinge barrel sits away from the frame edge, creating a new pivot point for the door, which prevents binding and results in a smooth, free-swinging door.

Slip-In

Unlike a typical hinge, slip-in hinges are manufactured without countersunk screw holes on the hinge leaves because they literally slip into a pocket behind either the hinge edge of the door, the frame, or both. Typically used with aluminum doors and frames, slip-in hinges might provide additional

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FIGURE 1.19 Pivot Reinforced Hinge
(Source: Courtesy of McKinney® Products Company)



FIGURE 1.20 Raised Barrel Butt Hinge
(Source: Courtesy of McKinney® Products Company)

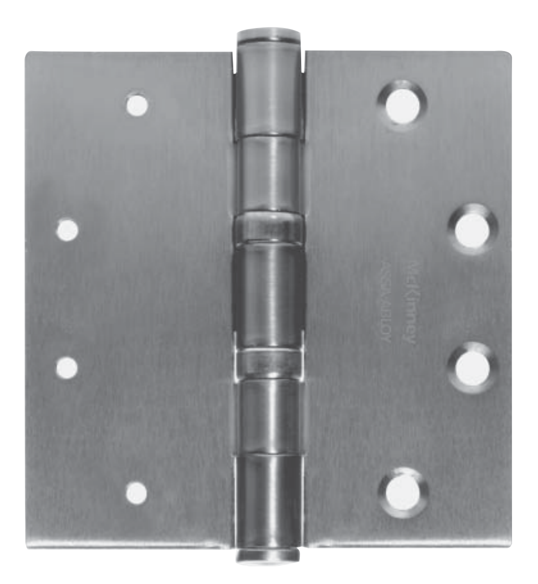


FIGURE 1.21 Slip-In Hinge
(Source: Courtesy of McKinney® Products Company)

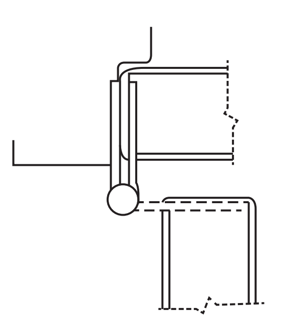


FIGURE 1.22 Slip-In Hinge Diagram
(Source: Courtesy of McKinney® Products Company)

reinforcement for both sides of the hinge leaf. The faces of the pockets on the door and frame would typically be drilled and tapped with countersunk screw holes at the time of manufacturing.

Spring

Spring hinges are manufactured most commonly 4–1/2-inches high by 4–1/2-inches wide for commercial applications. Instead of a conventional pin in the barrel, a spring in tension inside the solid barrel of the hinge keeps the hinge leaves pulling together toward the closed position. This allows the tension to force the hinge leaves together when pulled apart as the door swings away from the frame, essentially closing the leaves of the hinge and the door into the frame when let go.

The disadvantage of a spring hinge is the lack of door control due to the spring hinge having only one adjustment, which either tightens or loosens the spring tension and closing force. When spring hinges are used on doors, it is not uncommon for the doors to either not close all of the way all of the time or slam shut harder than desired. In addition to only having one adjustment available, the surrounding

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FIGURE 1.23 Spring Hinge
(Source: Courtesy of McKinney® Products Company)



FIGURE 1.24 Large Barrel Spring Hinge
(Source: Bommer Industries, Inc.)



FIGURE 1.25 Double-Acting Spring Hinge
(Source: Courtesy of Scott J. Tobias)

conditions such as air pressure, air conditioning, and heating at different times of the day and year will affect the closing force.

If you have spring hinges, especially in commercial applications, be prepared to adjust them frequently, depending on the frequency of use. It is recommended that a door closer be used in lieu of a spring hinge when possible due to the typical various valves that offer stages of closing. This assists with controlling the closing force to ensure proper closing and latching of the door into the frame as desired or required by code.

Per NFPA 80, if spring hinges are used on 3-foot by 7-foot by 1 3/4-inch fire rated doors, at least two of the three hinges provided must be spring type.

In addition to standard-sized spring hinges, there are other types including, a large single-barrel spring hinge, sometimes referred to as a "Bommer hinge." Although there are numerous manufacturers, Bommer is one of the oldest and most well-known manufacturers of large single-barrel spring hinges. These hinges can typically be seen on older city apartment doors.

Another type of spring hinge is a double-acting spring hinge, which is typically installed on double-acting doors. A double-acting door is typically used in restaurant kitchens for easy in and out access for the staff, and if specified and installed correctly, will return the door to the closed position every time.

Strap Hinge

Strap hinges are used for oversized doors such as barn doors. One leaf is typically installed as a standard hinge, and the other is not really a leaf, but a strap that is installed across the face of the door.

Some screen or storm doors appear to have strap hinges installed on them, but typically they are a decorative plate that is installed on the face while another hinge is actually hanging the door, typically a continuous hinge.

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FIGURE 1.26 Swing-Clear Hinge
(Source: Courtesy of McKinney® Products Company)

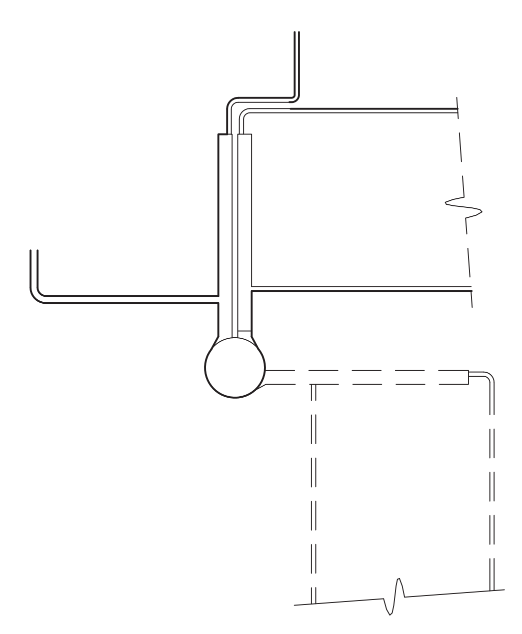


FIGURE 1.27 Standard Swing Hinge
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

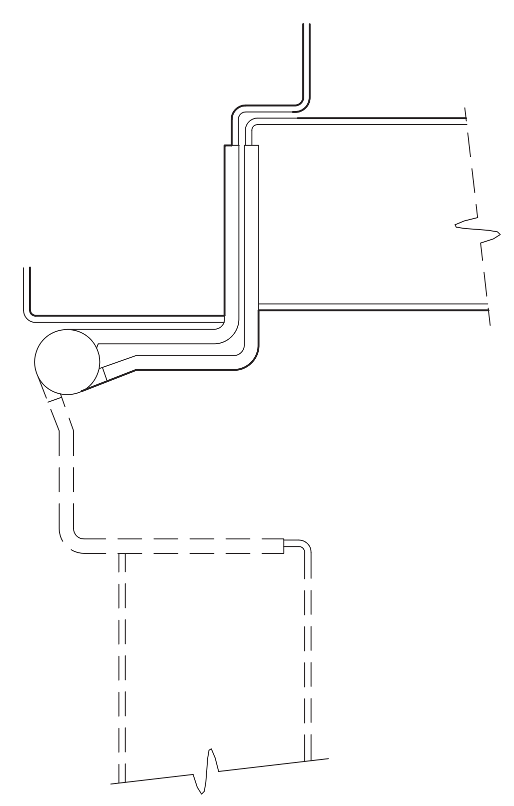


FIGURE 1.28 Swing-Clear Hinge
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

Swing Clear

A swing-clear butt hinge is typically used to swing a door out of the opening in order to increase the clear width opening of a doorway or corridor. The clear width of the opening is typically increased by the same dimension as the thickness of the door. For example, if a door is 1 3/4-inches thick and

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a swing-clear butt hinge is used, the clear width of the opening is increased by 1 3/4-inches to allow for more room to travel through the opening. This application is typically seen in cross-corridor door openings both voluntarily and by code to allow for stretchers, carts, wheelchairs, and people to travel through the opening. This allows for extra room without having to navigate a standard width, possibly getting caught up on or hitting the edge of the door while in the open position.

The swing-clear hinge is different from a typical butt hinge, which remains in the path of the door opening when in the open position (see Figures 1.27 and 1.28). Building codes and accessibility standards state that the clear width opening of a doorway must be a minimum of 32 inches. You might now ask, what defines a clear width opening? Good question; a clear width opening is the clear open space to pass through the door opening when measuring with the door open at 90 degrees, measured between the face of the door and the opposite stop face of the frame.

Tee Hinge

Tee hinges are manufactured in the shape of a tee, and are typically used for light-duty doors such as a screen door of a home. The top part of the tee is sideways and gets mounted to the frame like a butt hinge, and the longer portion lays across the front of the door similar to a strap hinge.

Wide Throw

A wide throw butt hinge has hinge leaves that are wider than standard sizes and typically wider than the height. A standard butt hinge for a 1 3/4-inch-thick door is 4 1/2-inches high by 4 1/2-inches wide, and if the door were to have an applied panel to the face, the width of the hinge would have to be the same dimension wider than 4 1/2 inches to clear the applied panel, or the butt hinge barrel would bind. For example, if the panel were 1/2-inch thick, then the hinge would be specified 1/2 inch wider to accommodate and allow the barrel of the hinge to clear the panel for proper operation without binding.



FIGURE 1.29 Tee Hinge
(Source: Scott J. Tobias)

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OPTIONS

Air Transfer

This option is available for the transfer of air for pneumatic devices, although by far it is not a common application and there is a lack of availability of devices. Locking and exit devices that are operated by the use of pneumatic air might be used in rooms that do not allow electricity due to the presence of explosive materials.

A more common use for pneumatic air is for automatic operators (see Chapter 5, Closing and Control Devices), but the air transfer required is typically much higher than an air transfer hinge would allow and is typically done directly to the device with wider tubing.

Decorative Tip

Decorative tips are available as an option to give the plain flat ends of a hinge some aesthetic appeal. The tips are typically installed at both ends of the hinge barrel and may require special pins with screws that protrude out of the tip. Some tips have threaded pins attached and are screwed into the flat end of the barrel. Although various manufacturers offer other types of decorative tips, the following are some of the more popular:

- Acorn tips: Shaped like an acorn, these tips have a rounded body with a soft pointed top.
- Ball tips: Shaped just like they sound, round like a ball
- Linear tips: With decorative grooves, some manufacturers offer unique aesthetics.
- Round tips: A rounded end that looks like the shape of a dome
- Steeple tips: Tall and shaped like the steeple of a church or temple, these tips resemble the same.
- Urn tips: Similar to a steeple tip near the top, an urn tip is wider and more rounded in the center.

Electric Transfer

Hinges are available with wires running through them, and electric transfer hinges are available for electric locking or release devices. An electrified lockset on a single door or a pair of doors or an electric



FIGURE 1.30 Acorn Tip

(Source: Courtesy of Scott J. Tobias)



FIGURE 1.31 Steeple Tip

(Source: Courtesy of McKinney® Products Company)



FIGURE 1.32 Ball Tip

(Source: Courtesy of Scott J. Tobias)

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strike on a pair of doors would require a device, which would transfer the power from the wall into the hinge leaf on the frame, through the barrel of the hinge and leaf on the door, and across the door to the electric device.

Depending on the function of the electrified system on the door opening, electric transfer hinges are available with various wire quantities. A simple system would only require four wires, while a more complex system or added options such as a signal switch might require as many as twelve.

Also, electric transfer hinges are intended to operate with low-voltage and amperage devices. If they are too high, there is a danger of overheating and damaging the devices that they operate, and this creates the danger of a fire. If the devices do require higher voltage, a power transfer device is required (see Chapter 10, Miscellaneous Items).

Some manufacturers furnish electrified transfer hinges with nonproprietary Molex® connectors, which are plastic connectors that are coordinated with the electrified hardware and power supplies. This allows all of the company's electrified devices to be manufactured with Molex® connectors, allowing any two devices to quickly and easily snap together like a plug-and-play device on your computer.



FIGURE 1.33 Flat Tip
(Source: Courtesy of McKinney® Products Company)



FIGURE 1.34 Round Tip
(Source: Courtesy of McKinney® Products Company)



FIGURE 1.35 Electric Transfer Hinge
(Source: Courtesy of McKinney® Products Company)



FIGURE 1.36 Electric Transfer Wired to Door
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

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FIGURE 1.37 Molex® Connector Hinge
(Source: Courtesy of McKinney® Products Company)

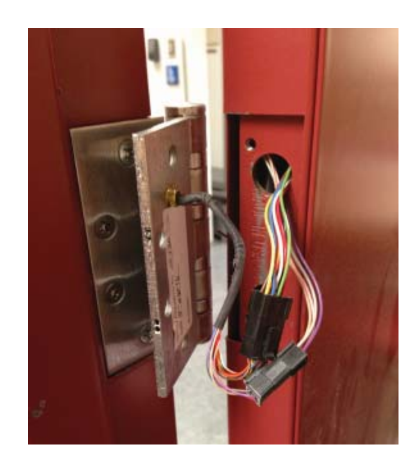


FIGURE 1.38 Molex® Connector Wired to Door
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)





FIGURE 1.39 Four-Pin Molex® Connector
(Source: Courtesy of McKinney® Products Company)

Hospital Tip

Hospital tips on butt hinges are an available option to create a smooth, flush, and sloped tip of the hinge barrel. This option is typically used in mental health facilities to reduce the gaps or spaces of the hinge. This helps to minimize an object having the ability to be tied or wedged in between the barrel and hinge leaf, creating a hanging situation.

Nonremovable Pin

Nonremovable pins (NRPs) are an option recommended for hinges used on secure doors that are reversed bevel, doors that swing and are pulled toward the user in lieu of pushing them away. The keyword here is "option"; hinge barrel pins are standard as removable and NRPs must be specified.

A nonremovable pin is a very inexpensive option—approximately $2 per hinge—and consists of a set screw on the inside of the hinge barrel, which is only visible and accessible while the door is open. NRPs prevent the possibility of the pin being popped out of the barrel with a hammer and screwdriver. Once the pin is out of the barrel, the door can essentially be pulled out of the frame from the hinge side, even if the door latch or deadbolt is in the locked position. An expensive mistake can be avoided for such a small cost if a nonremoveable pin hinge is used as necessary.

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FIGURE 1.40 Nonremovable Pin Full Mortise Hinge
(Source: Courtesy of McKinney® Products Company)

Nonrising Pin

Nonrising hinge pins are most typically used on commercial hinges, which means the pin will resist rising up out of the barrel with each rotation of the door and hinge leaves. This will help to reduce the hinge pin "rising" up out of the hinge barrel after frequent use of the door. Keep in mind that a pin that has risen out of the barrel can affect the performance of the hinge and level swing on the door.

Rising Pin

Rising pins are typically seen on residential doors and are less expensive than commercial hinges. You might typically notice the hinge pin "rising" up out of the hinge barrel after frequent use of the door. Keep in mind that a pin that has risen out of the barrel can affect the performance of the hinge and level swing on the door.

Security Stud

Security stud hinges prevent the hinges from being separated while in the closed position, where the pins are removable and can be popped out of the barrel. One leaf has a physical metal stud sticking out of it, while the matching position on the other leaf has a hole to accept it; this way, if someone tries to cut off the barrels of the hinge and pull the leaves apart, in essence pulling the door out of the frame, the security stud will not allow the leaves to separate.

Signal Switch

Sometimes referred to as a door position switch, each hinge leaf has a magnetic switch installed on the back side, which meets when the door and hinge are in the closed position. When the leaves split apart as the door swings open, the switch sends a signal to the security system, alerting one that the door is in the open position. This does not indicate, however, whether or not the lockset latch is in the latched or locked position, but there are other devices available for that function.

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FIGURE 1.41 Rising Pin on Full Mortise Hinge
(Source: Courtesy of Scott J. Tobias)



FIGURE 1.42 Rising Pin on Full Mortise Hinge Close Up
(Source: Courtesy of Scott J. Tobias)



FIGURE 1.43 Signal Switch Full Mortise Hinge
(Source: Courtesy of McKinney® Products Company)

QUANTITIES

Hinges are typically installed in consistent quantities; two hinges per leaf for openings through 60 inches to door height. One additional hinge per leaf for each additional 30 inches in height or fraction thereof, and four hinges for Dutch doors up to 90 inches in height. You might ask why four hinges for a Dutch door. A Dutch door is a split-leaf door that has a top half and bottom half that swing independently from each other. In order for the doors to swing at all, they need at least two hinges each to do so. There is no such thing as a split hinge.

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SWINGING DOORS WITH BUILDERS HARDWARE **80–19**

Table 6.4.3.1 Builders Hardware: Hinges, Spring Hinges, and Pivots

Maximum Door Rating (hr)	Maximum Door Size				Minimum Hinge Size				Hinge Type
	Width		Height		Height		Thickness		
	ft	m	ft	m	in.	mm	in.	mm	
For 1¾ in. (44.5 mm) or Thicker Doors									
3 or less	4	1.22	10	3.05	4½	114.3	0.180	4.57	Steel, mortise or surface
3 or less	4	1.22	8	2.44	4½	114.3	0.134	3.40	Steel, mortise or surface
1½ or less	3⅙	0.96	8	2.44	6	152.4	0.225	5.72	Steel, olive knuckle or paumelle
3 or less	4	1.22	10	3.05	4	101.6	0.225	5.72	Steel pivots (including top, bottom, and intermediate)
1½ or less	3	0.91	5	1.52	4	101.6	0.130	3.30	Steel, mortise or surface
1½ or less	2	0.61	3	0.91	3	76.2	0.092	2.34	Steel, mortise or surface
3 or less	3	0.91	7	2.13	4½	114.3	0.134	3.40	Steel, mortise or surface (labeled, self-closing, spring type)
3 or less	3	0.91	7	2.13	4	101.6	0.105	2.67	Steel, mortise or surface (labeled, self-closing, spring type)
For 1⅜ in. (34.93 mm) Doors									
3 or less	3	0.91	7	2.13	3½	88.9	0.123	3.12	Steel, mortise or surface
3 or less	2⅔	0.81	7	2.13	3½	88.9	0.105	2.67	Steel, mortise or surface (labeled, self-closing, spring type)

Note: Table 6.4.3.1 lists the most common applications of hinges, spring hinges, and pivots. Consult the door and hardware manufacturer's specific listings for applications not addressed in this table.

FIGURE 1.44 Hinge Quantity Chart

(Source: Reproduced with permission from NFPA 80–2013, Fire Doors and Other Openings Protectives, Copyright © 2012, National Fire Protection Association. This reprinted material is not the complete and official position of the NFPA on the referenced subject, which is represented by the standard in its entirety.)

APPLICATIONS

Full Mortise

Full mortise butt hinges are the most commonly installed type of butt hinge in new and most renovation type construction projects. Both of the hinge leaves are swaged and fully mortised into the edge of the door and frame allowing the hinge to sit flush with the edge of the door and frame.

Full Surface

Full surface butt hinges do not have swaged leaves and are surface-mounted onto the face of the door and frame, and there are two typical reasons why a full surface butt hinge would be installed. The first would be the use of a channel iron door and frame, which are so dense that they would typically not have a mortise preparation and hinge due to the intensive labor required and difficulty of doing so.

The second reason why a surface-mounted butt hinge might be used is in lieu of replacing a door or frame, which can be costly. Full surface butt hinges are used on an existing opening whose door and or frame preparation reinforcements have loosened, prohibiting a new hinge from being installed into the same preparation.

Although a surface-mounted butt hinge would be applied to a new location of the door and frame, being on the surface, the hinge would still be able to maintain the same pivot point as the existing full mortise hinges. (The pivot point is the center of the hinge barrel, which would need to be consistent from hinge to hinge up and down the edge of the door in order for the hinges to swing freely.)

Keep in mind, however, that, although you will have a smooth swinging door just as if the original hinge were in place functionally, aesthetically the difference would be seeing the actual leaves of the hinge spread across the face of the door or frame instead of just the barrel at the edge. The frame leaf

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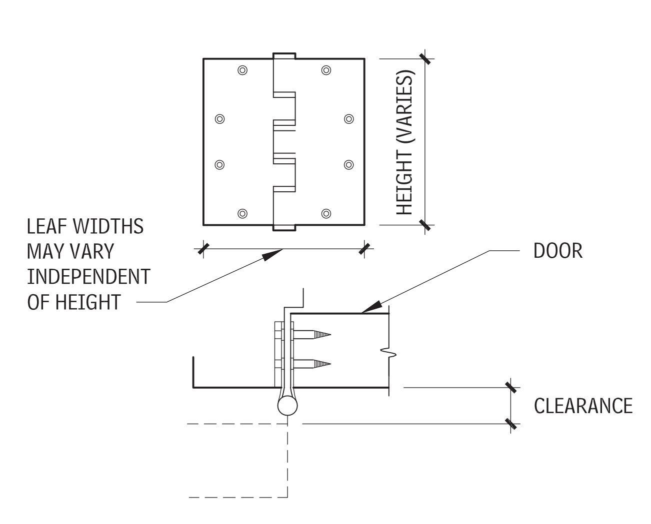


FIGURE 1.45 Full Mortise Hinge Diagram
(Source: The Graphics Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)



FIGURE 1.46 Full Mortise Hinge
(Source: Courtesy of McKinney® Products Company)

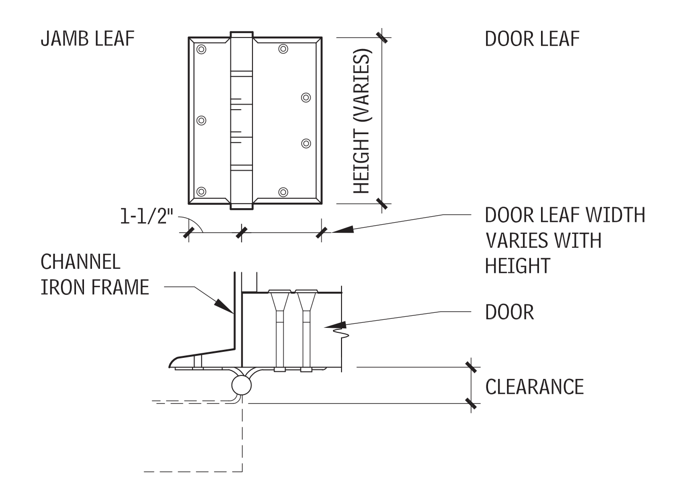


FIGURE 1.47 Full Surface Hinge Diagram
(Source: The Graphics Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)

is typically shorter than the door leaf, as a frame face is typically 2 inches wide, which is not enough room for a standard 4 1/2-inch-wide hinge leaf.

Half Mortise

"Half" butt hinges always refer to the door portion of the opening. Half mortise butt hinges have a swaged leaf on the door side, and similar to a full mortise hinge, are mortised into the edge of the door. The frame hinge leaf, similar to the full surface hinge, is not swaged and is surface-mounted onto the face of the frame.

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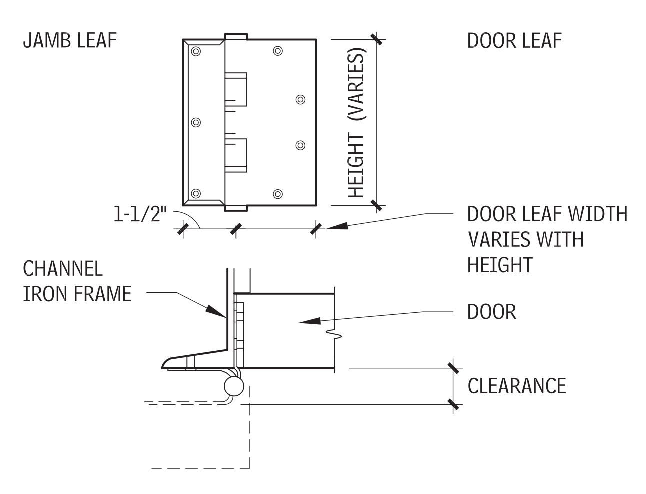


FIGURE 1.48 Half Mortise Hinge Diagram

(Source: The Graphics Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)



FIGURE 1.49 Half Mortise Hinge

(Source: Courtesy of McKinney® Products Company)

There are two typical reasons why a half mortise butt hinge would be installed. The first would be the use of a channel iron frame, which is so dense that it would typically not have a mortise preparation and hinge due to the intensive labor required and difficulty of doing so.

The second reason why a half mortise butt hinge might be used is in lieu of a frame having to be replaced, which can be costly. They are often used on an existing opening whose frame preparation reinforcements have loosened, prohibiting a new hinge from being installed into the same preparation.

Although a half mortise butt hinge would be applied to a new location of the frame, being on the surface, the hinge would still be able to maintain the same pivot point as the existing full mortise hinges. (The pivot point is the center of the hinge barrel, which would need to be consistent from hinge to hinge up and down the edge of the door in order for the hinges to swing freely.)

Half Surface

"Half" butt hinges always refer to the door portion of the opening. Half surface butt hinges are similar to the full surface hinge, are not swaged, and are surface-mounted onto the face of the door. The frame leaf is swaged, and similar to a full mortise hinge, is mortised into the edge of the frame.

There are two typical reasons why a half surface butt hinge would be installed. The first would be with the use of a channel iron door, which is so dense that they would typically not have a mortise preparation and hinge due to the intensive labor required and difficulty of doing so.

The second reason why a half surface butt hinge might be used is in lieu of a door having to be replaced, which can be costly. They are typically used on an existing opening whose door preparation reinforcements have loosened, prohibiting a new hinge from being installed into the same preparation.

Although a half surface butt hinge would be applied to a new location of the door, being on the surface, the hinge would still be able to maintain the same pivot point as the existing full mortise hinges. (The pivot point is the center of the hinge barrel, which would need to be consistent from hinge to hinge up and down the edge of the door in order for the hinges to swing freely.)

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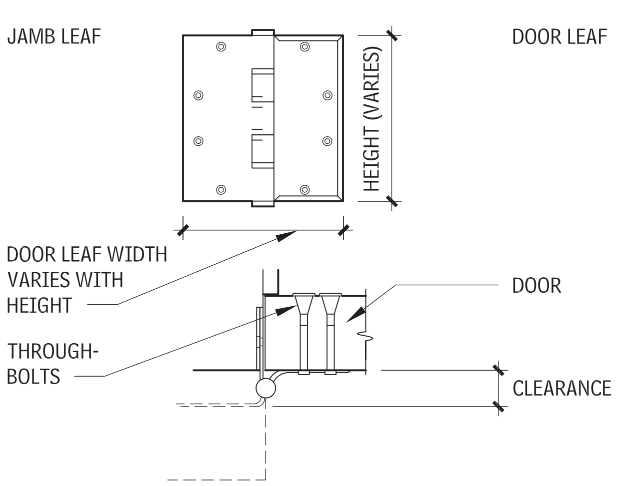




FIGURE 1.50 Half Surface Hinge Diagram
(Source: The Graphics Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)



FIGURE 1.51 Half Surface Hinge
(Source: Courtesy of McKinney® Products Company)

Keep in mind, however, that, although you will have a smooth swinging door just as if the original hinge were in place functionally, aesthetically the difference would be seeing the actual door leaf of the hinge spread across the face of the door rather than just the barrel at the edge.

INSTALLATION

Hinges may require the use of shims during installation to ensure a flush, plum installation. If the door opening is fire rated, there are specific requirements as to the type and installation of the shims.

Although hinges are the most commonly used means of hanging a door, they are also the least expensive and the least efficient. Because they are installed at various points on the frame's jamb and the door's hinge side of a door with nothing supporting the door from the bottom, a door on hinges is always in tension, "pulling" away from the frame. Further, every time a door is swung open or closed, more tension is created, pulling on the screws within the reinforcements of the door and frame that hold the hinges in place.

Depending on the frequency of door swing use, a door may show and operate with signs of early wear, such as separation of the door from the frame starting at the top, and separation of the hinge leaf from the hinge preparation on either the door or frame. Once this happens, the door typically sags, pulling more and more as the tension grows, quickly becoming an issue for swinging, closing, latching, and securing the opening.

Fasteners

Hinges are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat head are available depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

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FIGURE 1.52 Machine-Wood Combination Hinge Screw Fastener
(Source: Courtesy of McKinney® Products Company)

Locations

Hinges should be installed at locations as recommended by industry standards and codes, which are typically measured from the finished floor. Depending on the door and frame type, whether considered standard or custom metal, wood, or aluminum, standards recommend starting the first hinge from the finished floor.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have hinges installed 10 inches above the finished floor with the center hinge equal in distance from the top and bottom hinges (or additional center hinge, depending on the door height), and the top hinge is recommended to be located 5 inches from the top of the door.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the hinges installed anywhere up to 13 inches above the finished floor but, depending on the manufacturer, can be at any location up to that height. The middle hinges are installed equal in distance from the top and bottom hinges (or additional center hinge, depending on the door height), and the top hinge is recommended to be located up to 11 3/4 inches from the top of the door.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors and frames are recommended to have hinges in the same locations as custom steel doors and frames, with the bottom hinge installed 10 inches above the finished floor and the center hinge equal in distance from the top and bottom hinges (or additional center hinge,

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depending on the door height). The top hinge is also recommended to be located 5 inches from the top of the door.

Preparations

Hinge preparations are typically machined at the factory, including the drilling and tapping of screw holes. With metal doors and frames, the preparation is typically a cutout in the location where a hinge will go, and then a reinforcement plate is welded in place, which is where the hinge and screws will actually be secured.

When using a heavyweight hinge, the thicker gauge metal means that the materials to be mortised into a door are thicker, which means that the door and frame preparations have to be deeper than a standard hanging device to accommodate the thicker metal.

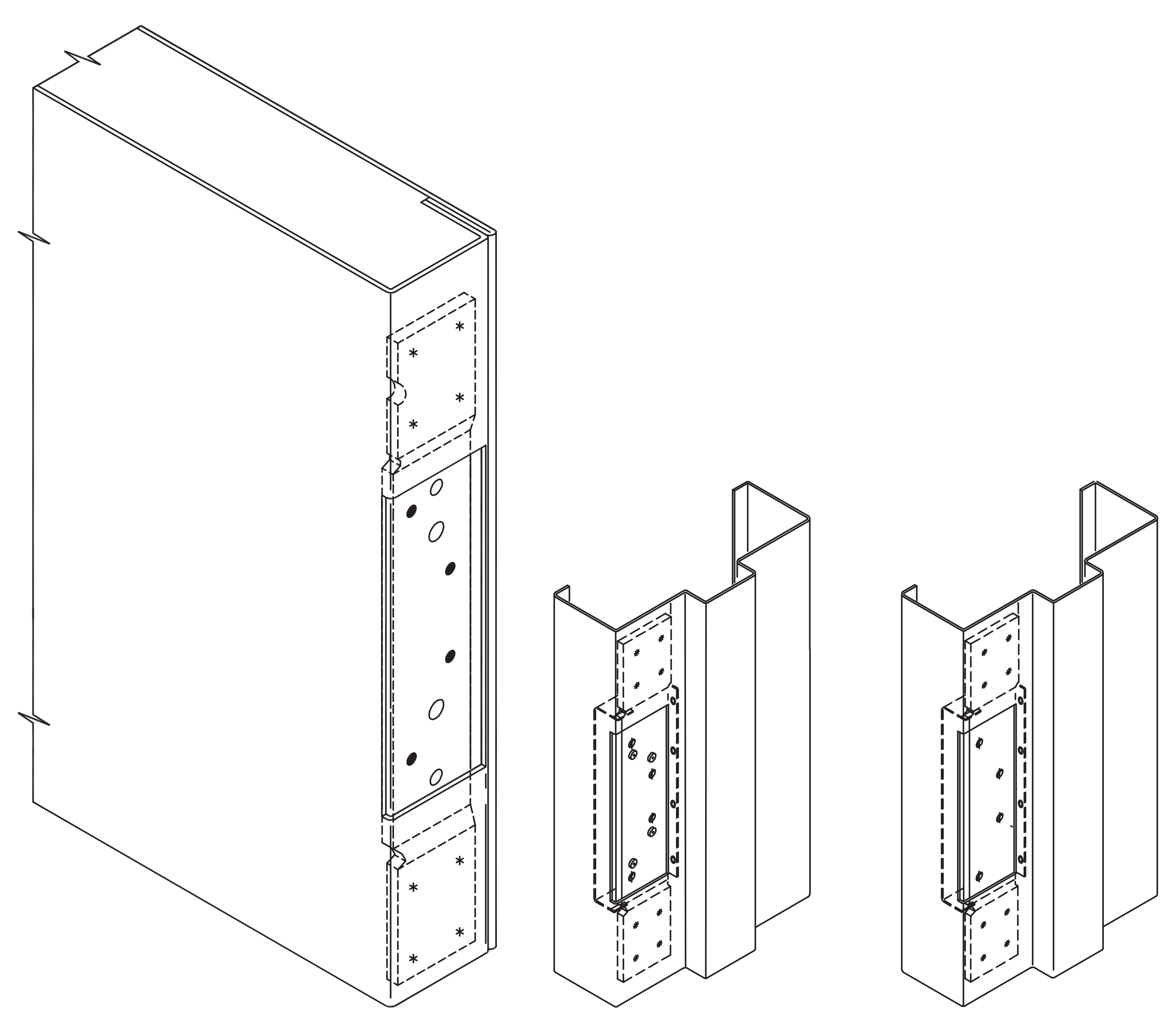


FIGURE 1.53 Hinge Preparations on Door
(Source: Courtesy of Ceco Door)

FIGURE 1.54 Hinge Preparations on Frame
(Source: Courtesy of Ceco Door)

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CONTINUOUS HINGES

Also Known As: Piano Hinges

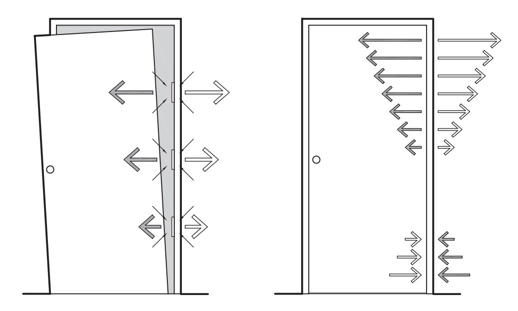


FIGURE 1.55 Standard vs Continuous Hinge Installation
(Source: Courtesy of Markar Architectural Products)

DESCRIPTION

Sometimes referred to as piano hinges, continuous hinges are a more efficient means of hanging a door than a standard hinge. This is true because the continuous hinge's length covers the entire height of the door and frame, which, unlike a hinge, supports the door's full height. Along with having many more fasteners on a continuous hinge, this helps prevent sagging from the top where most of the tension of the opening exists with the screws always trying to pull away from the edge of the door and frame.

Continuous hinges are also typically more secure than standard hinges because of the full door and frame height installation. This makes it much more difficult to pry apart the door and frame on the hinge side. It is true that air flow might be more restricted on the continuous hinge side of a door, but without proper weatherstripping or gasketing, there would not be much energy efficiency advantage to using a continuous hinge.

PROPERTIES

Similar to standard hinges, continuous hinges are manufactured with two leaves, except they are typically the same size in length as the door and frame height instead of small points on the door as with standard hinges. Continuous hinges are available as two types, geared or pin and barrel.

Bearings

Bearings separate the metal of the knuckles from directly touching and pivoting on each other. The inserts create a barrier between the metal parts, eliminating metal friction, which causes less wear on the knuckles than would a nonbearing hinge.

NONBEARING

Nonbearing hinges allow the knuckles of the barrel to directly meet, pivoting on each other with nothing to prevent the metal from wearing excessively. This is more likely on frequently used door openings rather than infrequently used ones, such as a closet or bedroom door in a home.

MEDICAL BEARING

Medical bearing continuous hinges are manufactured as barrel type hinge with a plastic insert separating the metal knuckles keeping them from directly touching. Not only do these inserts help with preventing

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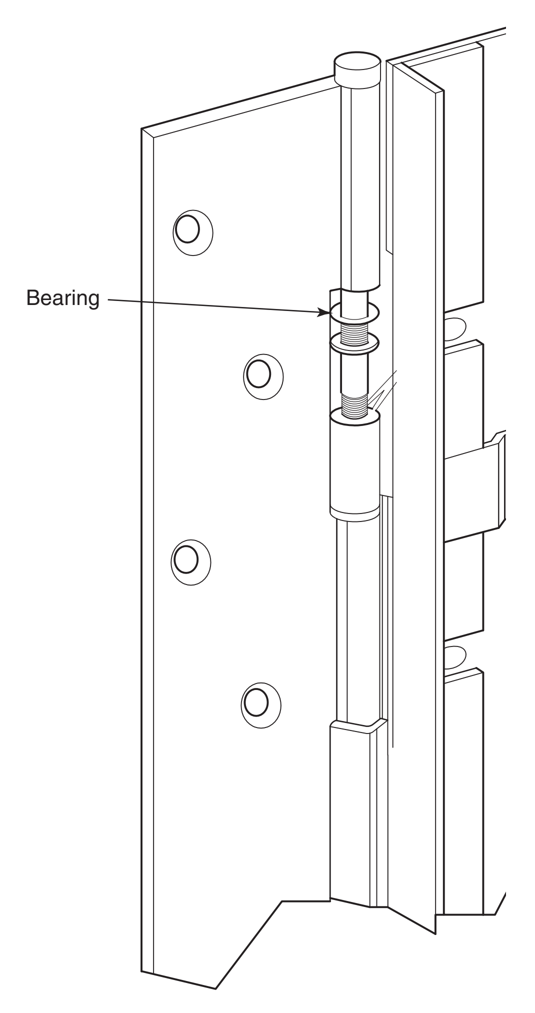


FIGURE 1.56 Medical Bearing for Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

wear of the knuckles from the metal touching metal, but these inserts also assist with the resistance to air flow between the hinge knuckles, which can transfer air particles from one room to another.

Corners

SQUARE CORNER

Continuous hinges are manufactured "standard" with square edges with 90-degree corners. Be cautious when handling the hinge, as the corner can be sharp at the point.

Finishes

Continuous hinges are typically available in fewer finishes than standard hinges and the choices are limited, depending on the base metal of the hinge. Painting continuous hinges (or anything else for that matter) on a project site is not recommended, as it will contribute to poor air quality for those working and in the space. Using a manufacturer's factory finish might even help contribute to credits toward a green building certification or code now or in the future.

ALUMINUM BASE METAL

Although some manufacturers offer additional finish options, aluminum continuous hinges are typically available from the factory with a clear anodized finish (US 628), dark bronze anodized

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(US 313), light bronze anodized (US 311), black anodized (US 315), and various powder-coated paint finishes, which are typically more durable than a conventional architectural finish and can be scratch resistant.

STEEL BASE METAL

Steel-based hinges are typically manufactured with a prime gray powder-coated finish, which is typically more durable than a conventional architectural finish, can be scratch resistant, and is intended to be painted in the field to match the door or surrounding conditions.

STAINLESS STEEL BASE METAL

Stainless steel hinges are typically available from the factory with a polished stainless steel finish (US 629) or satin stainless steel finish (US 630). With surface-mounted continuous hinges, although the hinge itself, which is connected to the door, is stainless steel, the housing, or the metal that covers the screws to give the hinge a cleaner appearance, might be manufactured with aluminum material with a brushed aluminum or clear-coated anodized aluminum finish (US 628).

Some manufacturers also offer various powder-coated paint finishes, which are typically more durable than a conventional architectural finish and can be scratch resistant.

Geared

Geared hinges have two leaves with alternating gears on each leaf that fit together to form the rotating portion of the hinge, which is typically covered by rectangular full-length housing. Geared hinges are typically manufactured with aluminum material and have the ability to carry lighter, less frequently used door weights than a pin and barrel type continuous hinge (see Grades in this chapter).

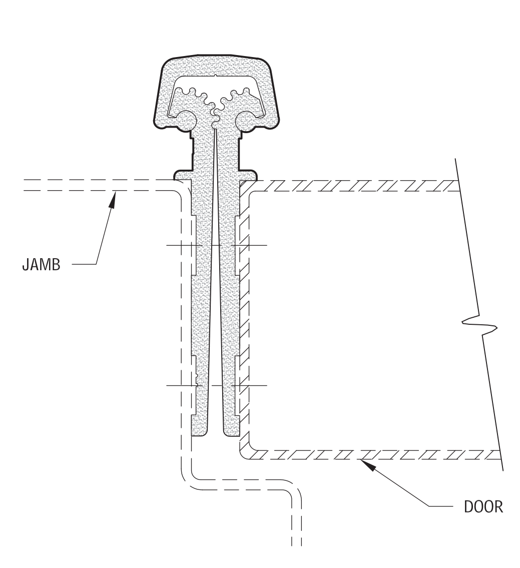


FIGURE 1.57 Geared Continuous Hinge Diagram
(Source: Courtesy of Pemko Manufacturing Company)



FIGURE 1.58 Geared Continuous Hinge
(Source: Courtesy of Pemko Manufacturing Company)

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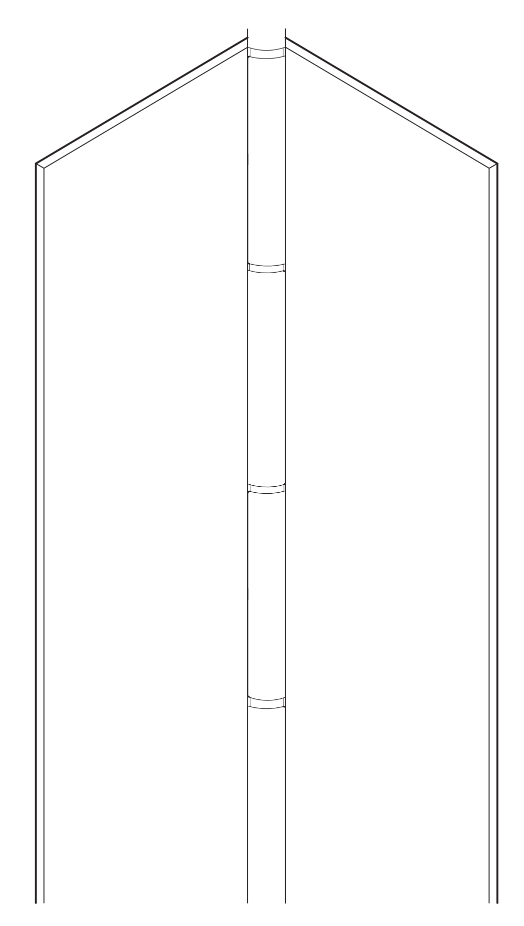


FIGURE 1.59 Blank Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

Hole Preparations

BLANK

Blank plates are available, which are continuous hinges without holes. They would typically be used in a hinge perimeter welded installation instead of securing the hinge to the door and frame with screw fasteners.

CUSTOM HOLE PATTERN

If for some reason a custom hole pattern is desired or required, some manufacturers offer that option for an additional cost due to the custom setup that will have to take place to create the custom hole pattern.

NONTEMPLATED

Nontemplated hinges are manufactured without standard fastener hole locations and holes can be placed at any location on the hinge leaves. These hinges tend to be less expensive and are typically used for residential applications.

PLUG WELD

In addition to the perimeter welding with a blank hole preparation, plug weld holes allow welding to take place within the body of the hinge in addition to the perimeter. Holes are drilled into the surface of the hinge leaves and the welds are made through the hole to the door surface, further bonding the two together.

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SYMMETRY TEMPLATED

Symmetry templated hinges are manufactured with equally patterned hole locations on the hinge leaves. Since door manufacturers typically do not drill and tap holes on the doors and frames for continuous hinges, there are no standard locations required as with standard hinges, as described in the ANSI/BHMA standards.

Materials

Continuous hinges can be manufactured from aluminum, brass, bronze, steel, or stainless steel, depending on their type, application, and fire rated door-opening requirements. If a door opening is fire rated, the codes state that hanging devices must be manufactured of steel to withstand the high temperatures of a fire for a certain period of time, depending on the surrounding wall rating.

If anything other than a steel-based continuous hinge is installed on a fire rated door opening and a fire occurs, the continuous hinge metal might melt enough to cause the opening to fail, allowing the fire to spread from one side of the opening to the other.

Pin and Barrel

Pin and barrel hinge leaves form the barrel of the hinge, similarly to a standard hinge, giving the door edge a more conventional hinge look than a gear-type hinge. Pin and barrel hinges typically hold more weight and withstand higher use and frequency than a geared continuous hinge.

Sizes

Continuous hinges are typically available for standard door heights such as 6 feet 8 inches, 7 feet, 7 feet 2 inches, 7 feet 6 inches, 8 feet, and so on, up to 10 feet. The hinges are typically manufactured 1 inch shorter in length than the actual door height to allow the door to close into the frame without any



FIGURE 1.60 Pin and Barrel Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

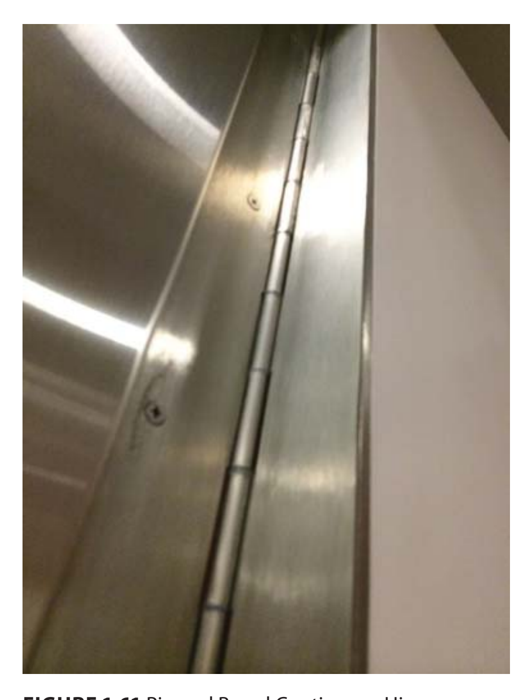


FIGURE 1.61 Pin and Barrel Continuous Hinge
(Source: Courtesy of Scott J. Tobias)

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FIGURE 1.62 Pin and Barrel Continuous Hinge
(Source: Courtesy of Scott J. Tobias)

binding. If the hinge were the full height of the door, the hinge metal would bind behind the stop of the frame. Frame stops protrude into the door opening and, if the hinge is closed into the frame at full height, the hinge metal thickness would interfere with the door closing fully.

Continuous hinge leaves are various in widths depending on the type. A full mortised or flush edge mount would be enough to extend the thickness of the door, less the inset dimension (typically 1/8 inch), which is the distance between the edge of the door and back and of the hinge leaf.

Swaging

Continuous hinge leaves are typically swaged. Swaging is a slight offset of the hinge leaf at the barrel. The offset accounts for the door edge, which is typically beveled. A beveled door edge is typically required for swinging doors so that the door edge does not bind with the square edge of the frame. If both edges were square, the door would not fit into the frame.

When in the parallel position, most hinge swaging provides a 1/16-inch clearance between the hinge leaves to accommodate for the door and frame clearance, which allows the door to swing in and out of the door frame without binding.

Weights

Continuous hinges are not categorized in grades as with most architectural hardware. They are available in different gauges, which is the thickness of the metal. They could also be considered light, medium, and heavyweight, depending on the thickness and amount of door weight they can hold.

With that said, continuous hinges can be manufactured with different quality levels, depending on the source and factory and possibly country standards.

Some manufacturers still manufacture continuous hinges in the United States, which are typically of superior quality to those manufactured in some other countries, known in the industry as imports.

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Door Weights per Square Foot
Based upon 3'0" x 7'0" Door Size

Hollow Metal Door Weights by Gauge

	Lbs. per Square Foot
20 Gauge	4
18 Gauge	5
16 Gauge	6
14 Gauge	7

Door Weights per Square Foot
Based upon 3'0" x 7'0" Door Size

Wood Door Weights by Door Thickness

	Lbs. per Square Foot	
	1 3/8" door	1 3/4" door
Particle/Mineral Core	4.75	5.25
Stave Core Wood	3.75	4.25
Hollow Core Wood	1.3	1.5

FIGURE 1.63 Door Weight per Square Foot Chart
(Source: Courtesy of McKinney® Products Company)

Imports are available for the most common and widely used sizes, typically for 3-feet-wide, 7-feet-high, and 1 3/4-inch-thick wood or metal swinging doors. The continuous hinges are less expensive than those still made in the United States and the low quality can sometimes be noticed with ragged edges, poor finishes, and suboptimal performance.

Due to the competitive nature of the door opening industry, some of the U.S. manufacturers now sell at the same level and price point of these continuous hinges to compete on projects through the distribution marketplace.

LIGHTWEIGHT

Lightweight continuous hinges would not typically be used on a commercial application but more likely on a residential or an infrequently used door or cabinet, or on a piano door (continuous hinges are also known as piano hinges). A lightweight continuous hinge is typically manufactured from aluminum, brass, or steel but can be of a thinner gauge than a medium or heavyweight continuous hinge for commercial applications.

MEDIUM/STANDARD WEIGHT

Medium-weight continuous hinges would typically be manufactured with 14-gauge material (.075 inch) with the ability to carry standard door weights up to 400 pounds with certain applications with restrictions allowing 600 to 1,000-pound infrequently used lead-lined doors.

HEAVYWEIGHT

Heavyweight continuous hinges would typically be manufactured with 12-gauge material (.105 inch) with the ability to carry heavy door weights up to 900 pounds.

Welded End Pins

This option is to tack weld the pins so that they become nonremovable to secure the opening when the door is out-swinging and the barrel is visible and able to be tampered with. The pins are attached to the fixed end knuckles of the hinge leaves so that the welding does not interfere with the rotation of the hinge barrel.

TYPES

Adjustable

An adjustable continuous hinge is a solution for those not-so-perfect installations, or existing situations where the surrounding conditions may have been altered since the original construction. These hinges do just what their name says: adjust to meet not-so-perfect conditions. If you have a frame or a door that is not flush, is out of alignment or is sagging, or the clearances have been altered over time, an

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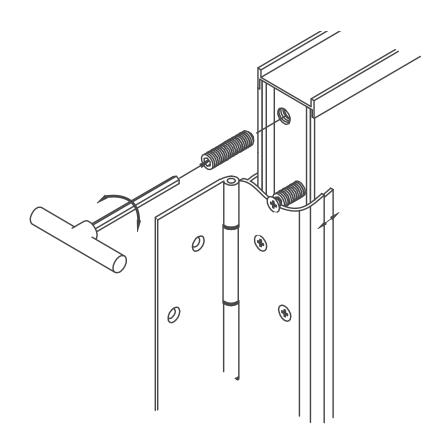


FIGURE 1.64 Adjustable Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

adjustable hinge will allow you to close the uneven gaps at the edge of the door and frame as required to get a flush installation. Keep in mind that the adjustments are limited and vary, depending on the manufacturer.

Edge Mount Safety Guard

Edge mount safety guard continuous hinges are available to protect the edge of a door in addition to hanging it. The hinge has additional metal, which wraps the edge of the door slightly to the face, protecting the edge from carts or stretchers as they go through the door opening. These hinges are also available as adjustable to meet not-so-perfect conditions. If you have a frame or a door that is not flush, is out of alignment or sagging, or the clearances have been altered over time, an adjustable hinge will allow you to close the uneven gaps at the edge of the door and frame as required to get a flush installation.

Raised Barrel

Typically a full mortise hinge and used when a door is recessed in a reveal in a frame; the hinge barrel is offset to allow a door to swing on the offset pivot point. When a door is recessed in a frame, a standard full mortise hinge barrel would not sit flush against the frame and door, leaving a gap and an incorrect, inefficient butt hinge installation, causing the door and frame to bind. By offsetting the hinge barrel, the hinge barrel sits away from the frame edge, creating a new pivot point for the door, which prevents binding and a smooth, free-swinging door.

Spring

Spring continuous hinges are manufactured in some of the same sizes as standard continuous hinges, except with a spring in tension inside the barrel of the hinge. This allows the tension to force the hinge leaves together when pulled apart as the door swings away from the frame, essentially closing the leaves of the hinge and the door into the frame when let go.

The disadvantage to a spring hinge is that it only has one adjustment by tightening or loosening the spring tension, and the doors will typically either not close all the way all of the time or slam shut more than desired due to all of the surrounding conditions such as air pressure, air conditioning, and heating levels at different times of the day and year.

If you have spring hinges, especially on commercial applications, be prepared to adjust them often, depending on the frequency of use. It is recommended that a door closer be used in lieu of a spring hinge when

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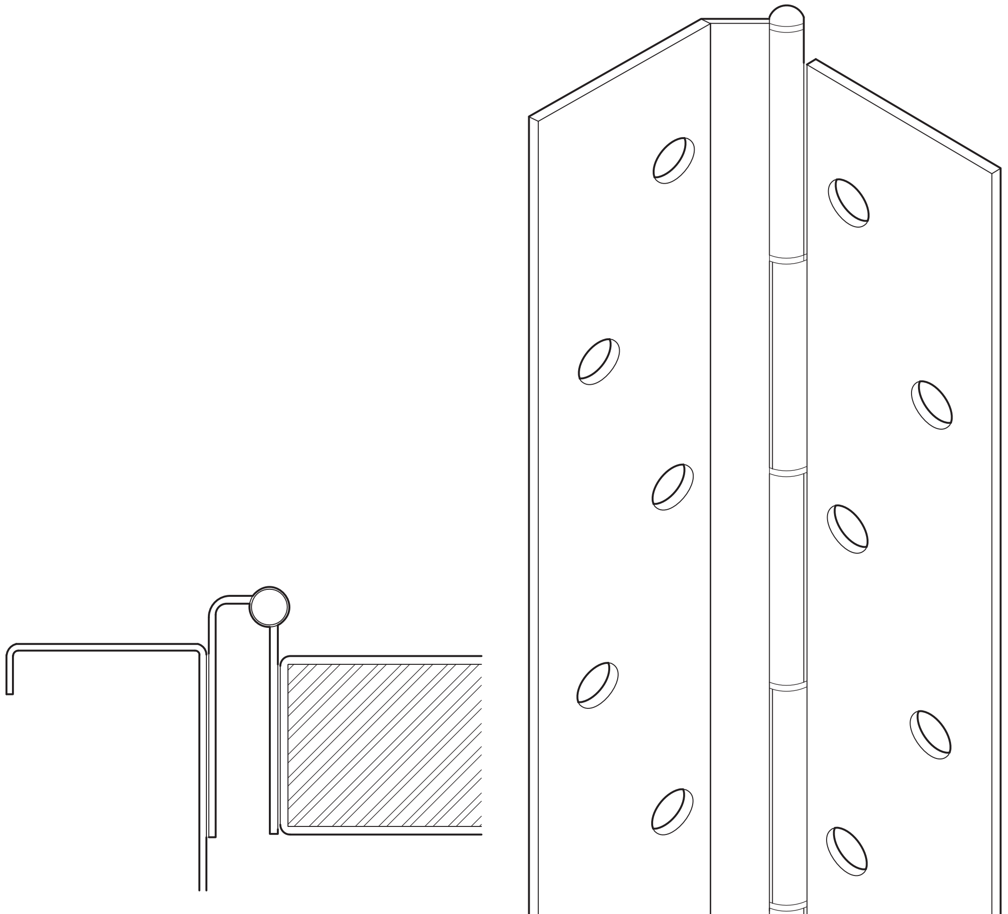


FIGURE 1.65 Edge Mount Safety Guard Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

FIGURE 1.66 Raised Barrel Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

possible because of the various valves that offer stages of closing. This assists with controlling the closing force to ensure proper closing and latching of the door into the frame as desired or required by code.

Swing Clear

A swing-clear continuous hinge is typically used to swing a door out of the opening in order to increase the clear width opening of a doorway. The clear width of the opening is typically increased by the same dimension as the thickness of the door. For example, if a door is 1 3/4-inches thick and a swing-clear butt hinge is used, the clear width of the opening is increased by 1 3/4 inches to allow for more room to travel through the opening. This application is typically seen in cross-corridor door openings both voluntarily and by code to allow for stretchers, carts, wheelchairs, and people to travel through the opening. This allows for extra room without having to navigate a standard width opening, possibly getting caught up on or hitting the edge of the door while it is in the open position.

A typical continuous hinge remains in the path of the door opening when in the open position (see Figure 1.68). Building codes and accessibility standards state that the clear width opening of a doorway must be a minimum of 32 inches. You might now ask, what defines a clear width opening? Good question. A clear width opening is the clear open space to pass with the door opening when measuring with the door open at 90 degrees, measured between the face of the door and the opposite stop face of the frame.

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To explain further, let's go through an example opening using a 36-inch-wide, 1 3/4-inches-thick hollow metal door and frame swinging on a standard mortise continuous hinge. Using the code to guide us as to where to measure, we come to the clear width dimension by deducting the door thickness, which is 1 3/4 inches, plus the width of both stops of the frame, which is typically 5/8-inch thick each, for a total of 3 inches. Deduct 3 inches from the original door width of 36 inches, and that leaves a 33-inch clear-width opening, which complies with the codes and standards. In addition, there are also restrictions regarding projections of door hardware into the clear width, so that it does not interfere with the clear-width requirement.

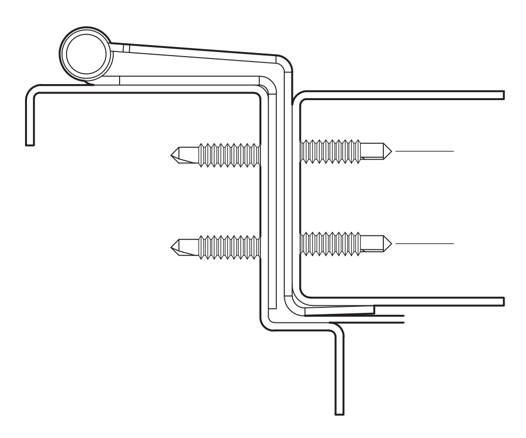


FIGURE 1.67 Swing-Clear Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

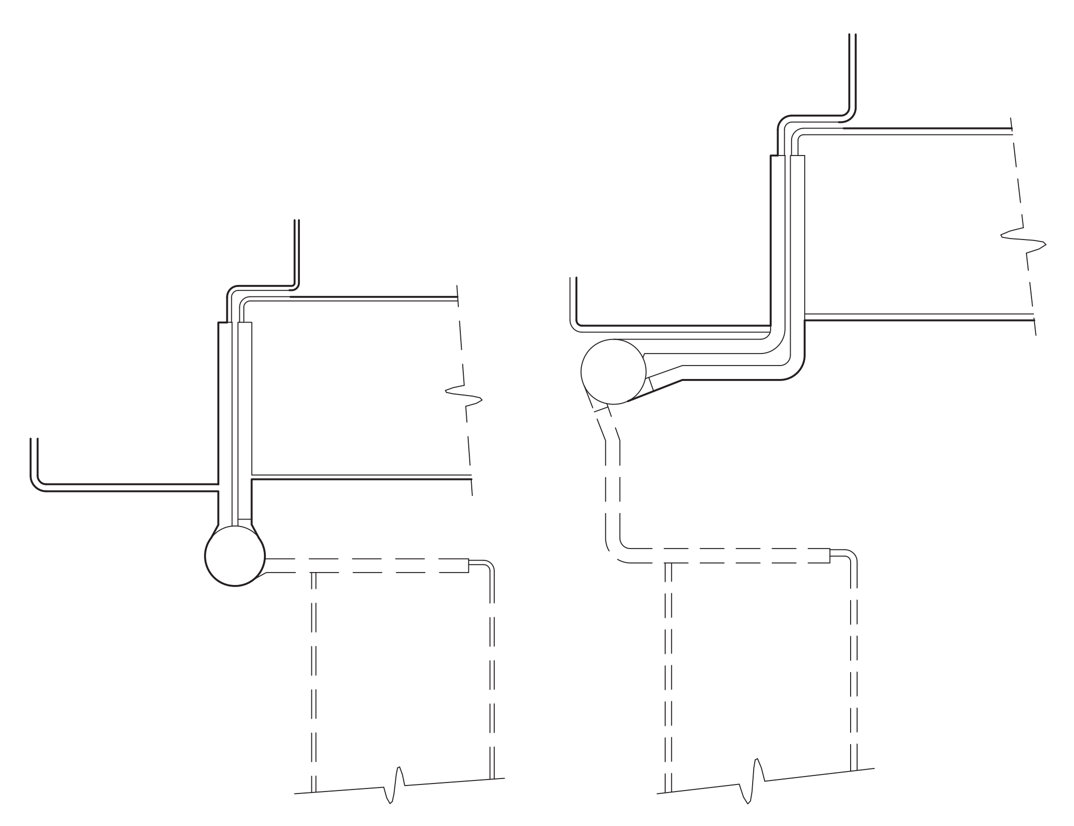


FIGURE 1.68 Standard Continuous (A) vs Swing-Clear (B) Continuous Hinge
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

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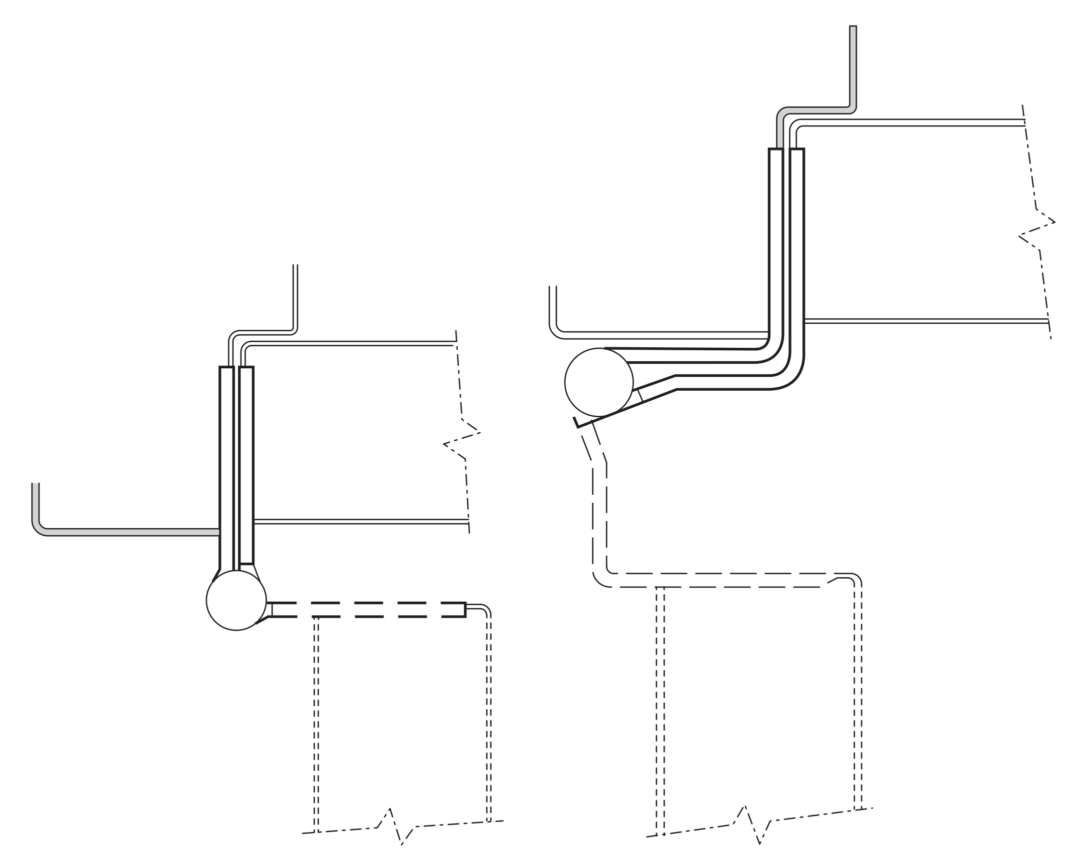


FIGURE 1.69 Standard Swing Continuous Hinge
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

FIGURE 1.70 Swing-Clear Continuous Hinge
(Source: Copyright © ASSA ABLOY, Inc. All rights reserved.)

Using the same situation as described above, if we were working on a major renovation of an existing building, which was constructed prior to the required minimum clear-width openings of today's codes and had 34-inch-wide openings, we would not meet the minimum clear-width requirements if we replaced the hinges with standard butt hinges using the same formula as above, which only give us a 31-inch clear-width opening. This can be a very costly renovation, having to rip out all of the doors and frames, widen the openings, and install new doors and frames to meet the requirements.

This is how a swing-clear hinge can help save cost and meet the required codes. If we start with the same 34-inch-wide door opening, use the same formula as above, but use swing-clear continuous hinges instead of standard continuous hinges, we can increase the clear width by the door width, which is 1 3/4 inches, increasing our 31 inches to 32 3/4 inches, meeting the required codes.

OPTIONS

Automatic Door Bottom Cut

When using an automatic door bottom, depending on the type and size, special cutouts might be required to accommodate the location of the door bottom so that it does not conflict at the same location on the door.

Current Transfer Preparation

Continuous hinges are available with cutouts to accommodate electric power transfer devices for easy installation and access for maintenance or replacement (see Chapter 2, Securing Devices). Power

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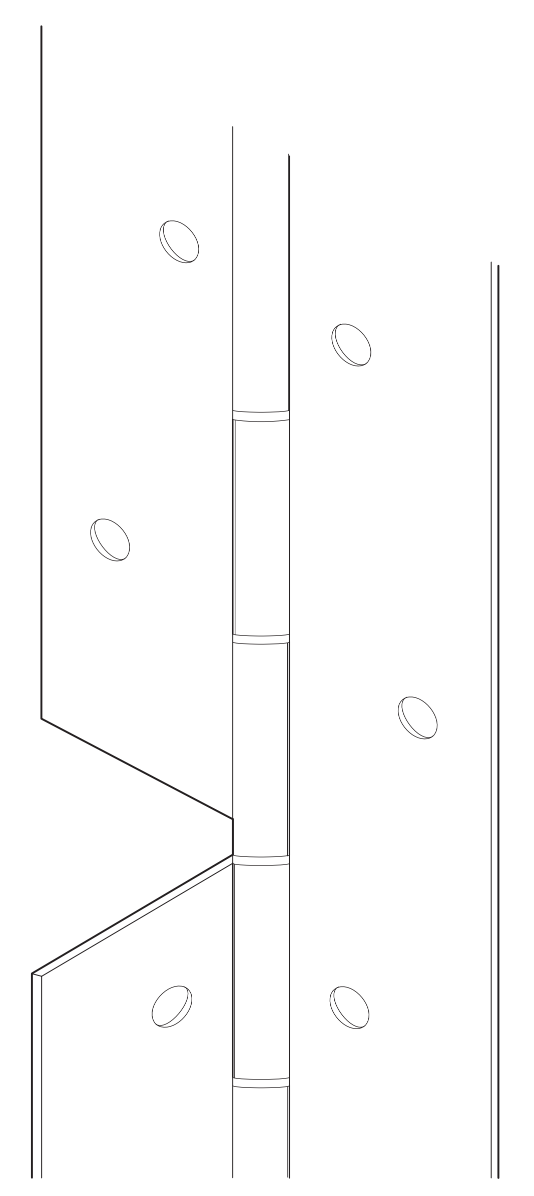


FIGURE 1.71 Dutch Door Continuous Hinge Preparation
(Source: Courtesy of Markar Architectural Products)

transfers are similar in function to an electric transfer hinge but are able to transfer higher voltage and amperage than can an electric transfer hinge.

Custom Design

Some manufacturers will custom make a continuous hinge to your design requirements as long as they comply with all required standards and codes. Of course, this would be for an additional cost.

Dutch Door Preparation

Dutch door continuous hinges are manufactured specifically for Dutch doors, which are single doors that are split horizontally. These doors are typically used for some type of pass-through and might have a shelf on the bottom leaf, as with a coat check room. A conventional continuous hinge is just that, continuous and would not allow a split door to open, whereas a Dutch door hinge is split and allows the top and bottom leaves to swing freely and independently.

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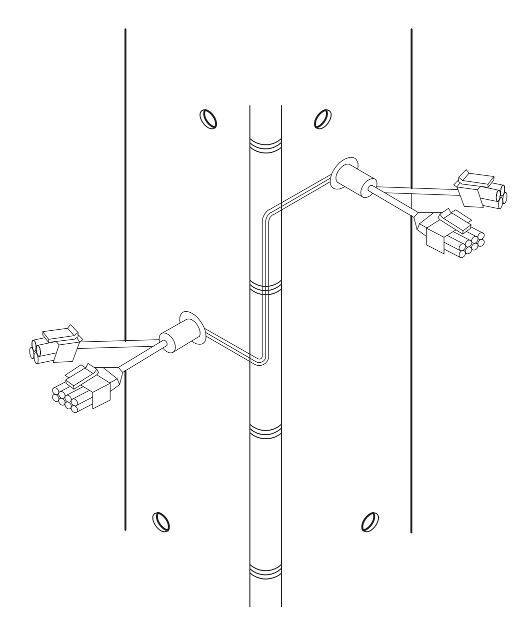


FIGURE 1.72 Electric Transfer Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

Edge Guard Cutouts

When using an edge guard continuous hinge to add protection to the door edge, depending on the other hardware installed on the door, additional cutouts might be required.

ACTIVE LEAF CUTOUTS

- Latch cutout for a bored/cylindrical lockset, also known in the industry as a 161 preparation
- Body cutout for a mortise lockset, also known in the industry as an 86 preparation

INACTIVE LEAF CUTOUTS

- Manual flushbolt cutout
- Automatic flushbolt cutout
- Automatic flushbolt strike cutout

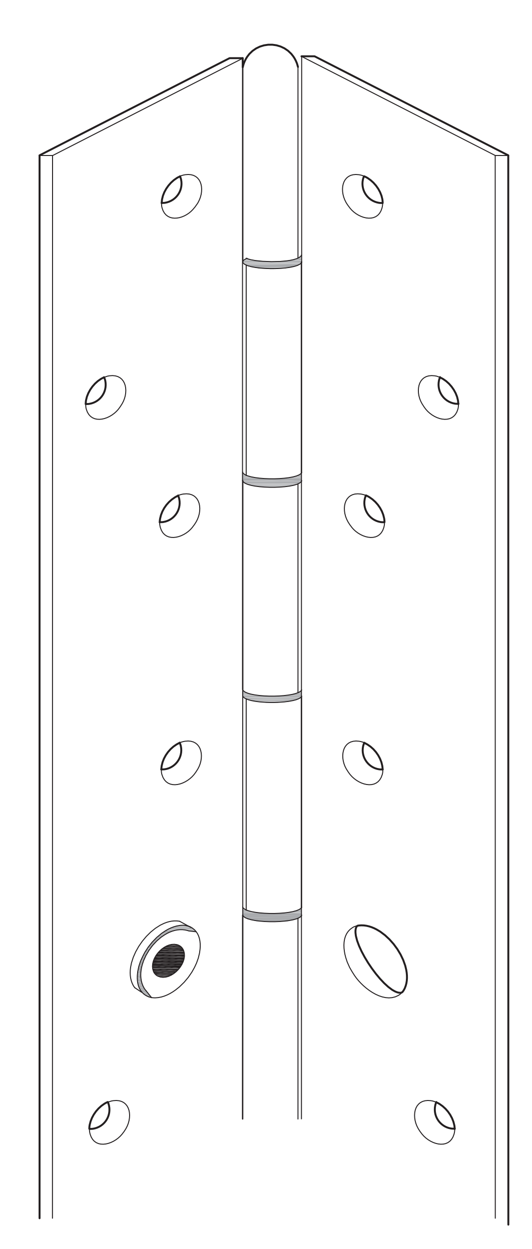
Electric Transfer

Continuous electric transfer hinges are available with wires running through them and are an option for transferring power and powering electric locking or release devices on a door. An electrified lockset on a single door or pair of doors or an electric strike on a pair of doors would require a device, which would transfer the power from the wall into the continuous hinge leaf on the frame, through the barrel of the continuous hinge and leaf on the door, and across the door to the electric device.

Depending on the function of the electrified system on the door opening, electric transfer continuous hinges are available with various wire quantities. A simple system would only require four wires, while a more complex system with added options, such as a signal switch, might require as many as twelve wires.

Also, electric transfer continuous hinges are intended to operate with low-voltage and low-amperage devices. If voltage or amperage are too high, there is a danger of overheating and damaging the devices and those that they operate, and it creates the danger of a fire. If the devices do need higher voltage, a power transfer device is required (see Chapter 10, Miscellaneous Items).

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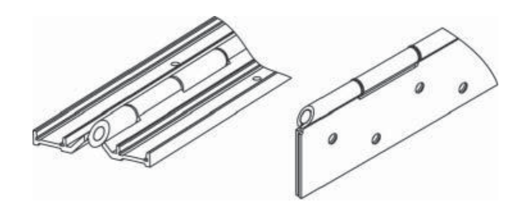


FIGURE 1.73 Hospital Tip Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

FIGURE 1.74 Security Stud Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

Some manufacturers furnish electrified transfer continuous hinges with nonproprietary Molex connectors, which are plastic connectors that are coordinated with the electrified hardware and power supplies. This allows all of the company's electrified devices to be manufactured with Molex connectors, allowing any two devices to quickly and easily snap together like a plug-and-play device on your computer.

Hospital Tip

Hospital tip continuous hinges are available to create a smooth, flush, and sloped tip of the hinge barrel without any gaps or spaces that would allow something to be wedged in between the barrel and hinge leaf. These continuous hinges are typically installed on openings in mental health facilities to reduce the possibility of a patient harming him- or herself by tying a string around the hinge barrel to create a hanging situation.

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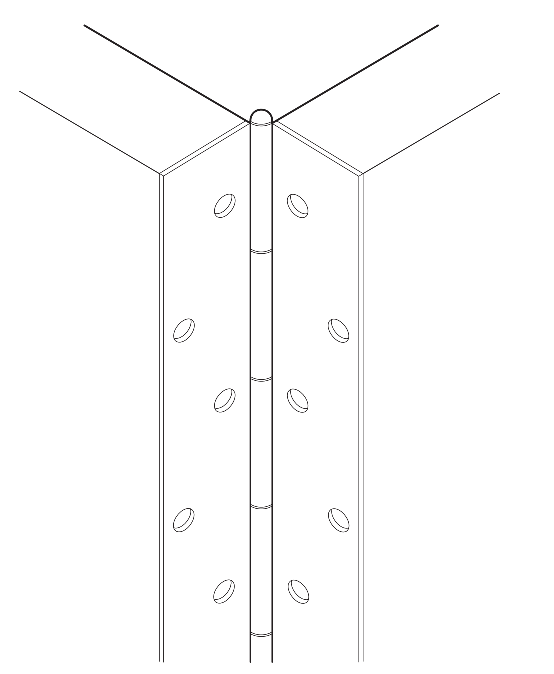


FIGURE 1.75 Sheared Leaf
(Source: Courtesy of Markar Architectural Products)

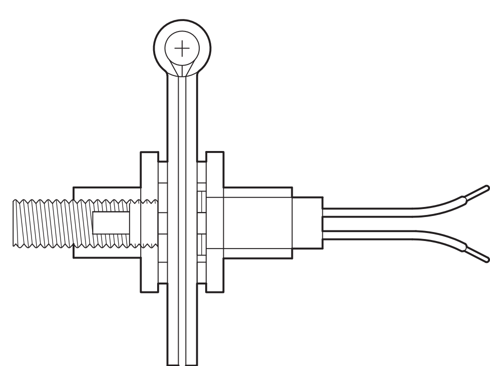


FIGURE 1.76 Signal Switch Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

Lead Lined

Continuous hinges are not actually lead lined, but the fastener hole pattern on each leaf is set in a way so as not to interfere with the lead lining of a door and frame. If the fasteners were to penetrate the lead lining in either the door or frame, it would create a hole in the lead and radiation could escape through the hole to the other side of the opening where the protection for those passing by would be eliminated.

Security Stud

Security studs prevent the hinges from being separated while in the closed position. One leaf has a physical metal stud sticking out of it, while the matching position on the other leaf has a hole to accept it; this way, if someone tries to cut off the barrels of the hinge and pull apart the leaves, in essence pulling the door out of the frame, the security studs will not allow the leaves to separate.

The studs might also extend into the back of the door hinge leaf, which means that the door leaf itself has to be prepared to accept the studs recessed into it.

Sheared Leaf

Sheared leaf continuous hinges are available for narrow door thicknesses or frame rabbets. You must specify the desired dimension so that the factory can shear the leaves of the hinges to suit your special application.

Signal Switch

Sometimes referred to as a door position switch or monitoring switch, each hinge leaf has a magnetic switch installed on the back side, which meet when the door and hinge are in the closed position. When the leaves split apart as the door swings open, the switch sends a signal to the security

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system, alerting one that the door is in the open position. This does not indicate, however, whether or not the lockset latch is in the latched or locked position, but there are other devices available for that function.

Special Lengths

Although continuous hinges are typically available in standard lengths to accommodate standard door heights, some manufacturers offer custom lengths for an additional cost.

Wide Throw

A wide throw continuous hinge has hinge leaves that are wider than standard sizes and typically wider than they are high. If the door were to have an applied panel to the face, the width of the hinge would have to be the same dimension wider than a standard hinge leaf to clear the applied panel, or the continuous hinge barrel would bind. For example, if the panel were 1/2 -inch thick, then the hinge would be specified 1/2 -inch wider to accommodate and allow the barrel of the hinge to clear the panel for proper operation without binding.

QUANTITIES

Continuous hinges are typically furnished one per door leaf. There are options for a Dutch door continuous hinge, which is split at the door split. Another option for a Dutch door would be to install two separate continuous hinges, one for the top leaf and one for the bottom.

APPLICATIONS

Full Mortise/Edge Mount

Full mortise continuous hinges are the most commonly installed type of continuous hinge in new and most renovation type construction projects. Both of the hinge leaves are swaged and fully mortised into the edge of the door and frame, allowing the hinge to sit flush with the edge of the door and frame.

Full Surface/Flush Mount

Full surface continuous hinges do not have swaged leaves and are surface-mounted onto the face of the door and frame. There are two typical reasons why a full surface continuous hinge would be installed. The first is the use of a channel iron door and frame, which are so dense that they would typically not have a mortise preparation and hinge due to the intensive labor required and difficulty of doing so.

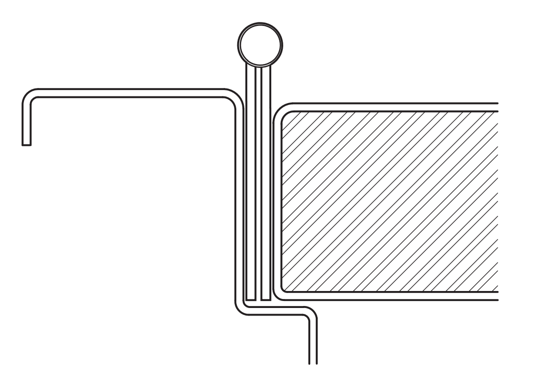


FIGURE 1.77 Full Mortise Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

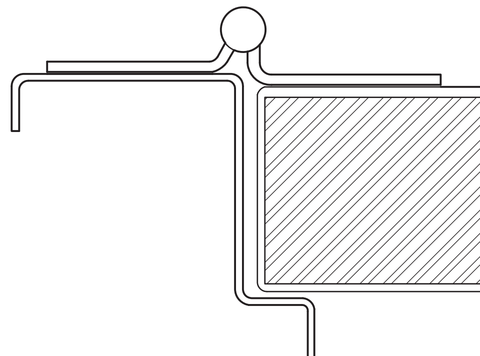


FIGURE 1.78 Full Surface Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

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The second reason why a surface-mounted continuous hinge might be used is in lieu of replacing a door or frame, which can be costly. This type of hinge can be used on an existing opening whose door and or frame preparation reinforcements have loosened, prohibiting a new hinge from being installed into the same preparation.

Although a surface-mounted continuous hinge would be applied at a new location on the door and frame, being on the surface, the hinge would still be able to maintain the same pivot point as the existing hinges. (The pivot point is the center of the hinge barrel, which would need to be consistent from hinge to hinge up and down the edge of the door in order for the hinges to swing freely.)

Keep in mind however, that, although you will have a smooth swinging door just as if the original hinge were in place functionally, aesthetically the difference would be seeing the actual leaves of the hinge spread across the face of the door or frame instead of just the barrel at the edge.

Half Mortise

When speaking of half continuous hinges, the "half" always refers to the door portion of the opening. For example, half mortise continuous hinges have a swaged leaf on the door side, and are mortised into the edge of the door. The frame door butt hinge leaf is not swaged and is surface-mounted onto the face of the frame similarly to a full mortise continuous hinge. The frame leaf is usually shorter than the door leaf, as a frame face is typically only 2 inches wide, which is not enough room for a standard 4 1/2-inch-wide hinge leaf. There are two typical reasons why a half mortise continuous hinge would be installed. The first would be the use of a channel iron frame, which is so dense that it would typically not have a mortise preparation and hinge due to the intensive labor required and difficulty of doing so, which is why a half continuous butt hinge would be applied. Another reason why a half mortise continuous hinge might be used is for an existing opening whose frame preparation reinforcements have loosened and failed, which would prohibit someone from being able to screw a new hinge into the same preparation. A half mortise continuous butt hinge would be applied to a new location on the frame, on the surface, which would maintain the same pivot point as the existing hinges, both not requiring the existing cutout and preparation for support and saving the frame from having to be replaced, which can be costly. Keep in mind, however, although this is a cost savings, the aesthetics will not be the most pleasing, seeing the entire hinge on the face of the frame instead of just the barrel.

Half Surface

Half continuous hinges always refer to the door portion of the opening. Half surface continuous hinges have a swaged leaf on the door side, and similar to a full surface hinge, are mortised into the edge of the door. The frame hinge leaf, similar to the full surface hinge, is not swaged and is surface-mounted onto the face of the frame.

There are two typical reasons why a half surface continuous hinge would be installed. The first would be the use of a channel iron frame, which is so dense that it would typically not have a mortise preparation and hinge due to the intensive labor required and difficulty of doing so.

The second reason why a half surface continuous hinge might be used is in lieu of a replacing frame, which can be costly. Another instance where it would be appropriate to use a half surface continuous hinge might be when an existing opening has frame preparation reinforcements that have loosened, prohibiting a new hinge from being installed into the same preparation.

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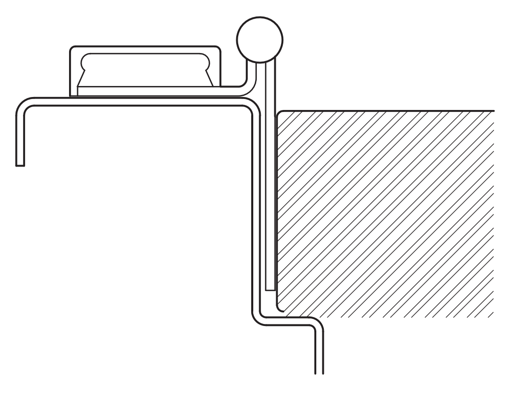


FIGURE 1.79 Half Mortise Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

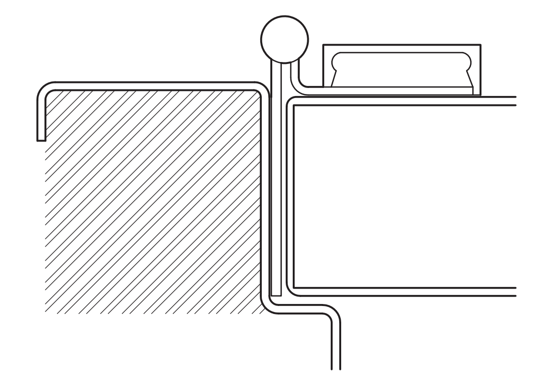


FIGURE 1.80 Half Surface Continuous Hinge
(Source: Courtesy of Markar Architectural Products)

Although a half surface continuous hinge would be applied to a new location of the frame, being the surface, the hinge would still be able to maintain the same pivot point as the existing hinges.

Keep in mind, however, although you will have a smooth swinging door just as if the original hinge were in place functionally, aesthetically the difference would be seeing the actual frame leaf of the hinge spread across the face of the frame instead of just the barrel at the edge.

INSTALLATION

Continuous hinges are the second most commonly used and expensive type of hanging device. Because they are typically installed the same as the full height of the door, unlike standard hinges, the weight of the door is distributed along the entire height instead of various points of the door.

Similar to one with standard hinges, the door still has nothing supporting it from the bottom, so the tension still exists, albeit it is less than with standard hinges.

Although less than with standard hinges, depending on the frequency of door swing use, a door may show and operate with signs of early wear, separation of the door from the frame starting at the top, and separation of the hinge leaf from the hinge preparation on either the door or frame. Once this happens, the door typically sags; pulling more and more as the tension grows, quickly becoming an issue for swinging, closing, latching, and securing the opening.

Fasteners

Continuous hinges are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat head are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Continuous hinges are typically placed along the length of the entire door height less 1 inch to avoid binding with the stop on the frame. As with all hardware applications, check to see if there are any conflicts such as a protection plate being installed with a surface-mounted continuous hinge. Adjust

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the protection plate width accordingly so the surface continuous hinge has a flat smooth surface upon which to install.

Preparations

Continuous hinges do not require any special preparations at the edge of the door other than reinforcements and the door being manufactured narrower to accommodate for the installation for a full mortise hinge.

Screw holes are not typically drilled and tapped at the factory, especially for wood doors, unless specifically requested. Expect a costly up-charge when requesting factory drilling and tapping. Similar to a standard hinge, when using a heavy weight continuous hinge, thicker gauge metal means that the materials will be thicker and the door width will be narrower than a door with a standard weight continuous hinge.

PIVOTS

Also Known As: Pivot Set, Pivot Hinge

DESCRIPTION

Pivots can be manufactured as various types to accommodate various door sizes, thicknesses, weights, existing conditions, and fire ratings. They can also be manufactured with various bearing types or no bearings at all, which can affect the swinging operation of the door. Specialty pivots are available for various types of special applications such as oversized doors, aesthetic design aspects of an opening, and door- and frame-applied materials.

Conventional pivots do not typically return a door to center, but there are some lighter-duty spring pivots that have that option. For devices that return a door to center, see Hanging Means, Floor Closers in this chapter.



FIGURE 1.81 Standard Duty Center Pivot Set
(Source: Courtesy of Rixson®)

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PROPERTIES

Pivots are typically furnished in sets, which are installed at the top and bottom of the door and are connected to the head of the door opening or frame and the floor.

Bearings

Pivots that are manufactured with bearings separate the metal of the knuckles from directly touching and pivoting on each other. The inserts create a barrier between the metal parts eliminating metal friction, which causes less wear on the knuckles than would a nonbearing pivot.

ANTI-FRICTION BEARING

Anti-friction bearings have a material manufactured in between the two leaves of the pivot plates to prevent the metal from wearing on metal to give the device a longer life cycle without defect.

THRUST BEARING

Thrust bearings help support the weight or vertical load of the door, or the weight resting on top of the bottom arm and pivot.

NEEDLE BEARING

Needle bearings help support the lateral force of the opening, or the swinging from side to side on the pivot point.

Bushings

A bushing is a material used typically to separate the two portions of a top or intermediate pivot where they join, similar to bearings of a hinge, continuous hinge, or bottom pivot (see Hanging Means, Hinges, Properties, and Bearings in this chapter).

Materials

Pivots are manufactured from steel, brass, bronze, stainless steel, or aluminum depending on their application and fire rated door opening requirements. If a door opening is fire rated, the codes state that hanging devices must be manufactured of steel to withstand the high temperatures of a fire.

If anything other than a steel base is installed on a fire rated door opening and a fire occurs, the hinge metal might melt enough to cause the opening to fail, allowing the fire to spread from one side of the opening to the other.

TYPES

Bottom Pivot

The bottom pivot is typically an arm connected to a floor plate on a spindle and similarly to a top pivot, allowing the arm to rotate on the floor plate and the door to swing open and closed from a frame or door opening. For floor conditions that do not allow conventional fastening, there are some bottom pivots that rest on the floor but attach to the jamb instead (see Figure 1.82). Depending on the manufacturer, the pivot point might be covered by a cap with a screw fastener to cover the knuckle or joining portion of the two arms for aesthetics.

Other applications for bottom pivot arm configurations and fastening are available specifically for concrete and some have vertical adjustments, which move the pivot up and down within limits to accommodate for floors that are not level.

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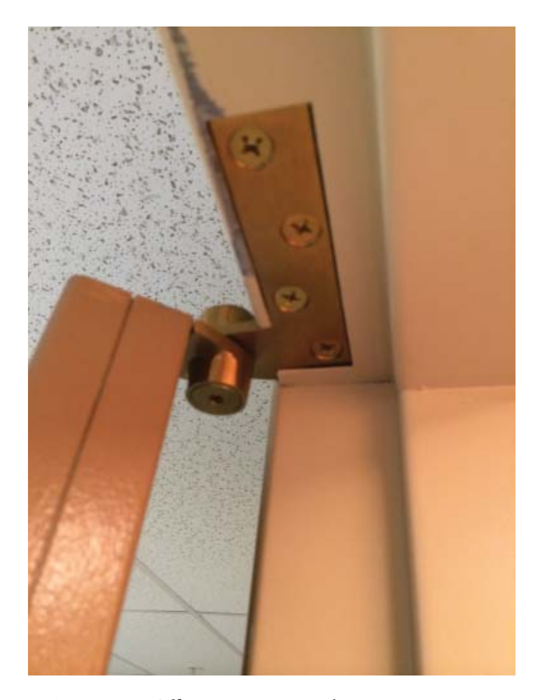


FIGURE 1.82 Offset Top-Mounted Pivot
(Source: Courtesy of Rixson®)

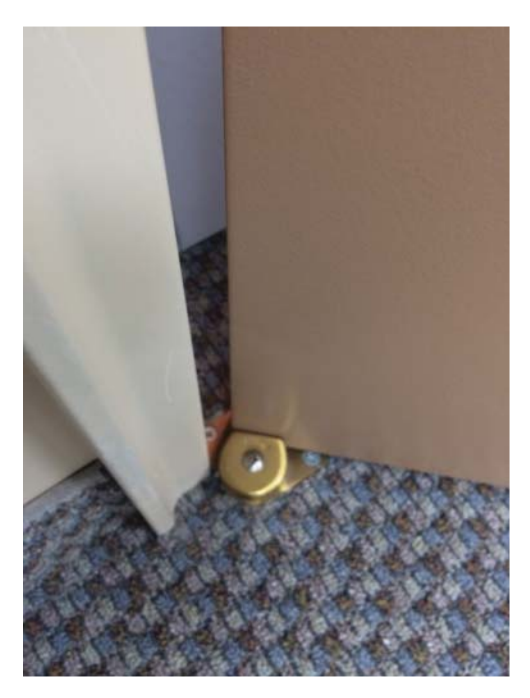


FIGURE 1.83 Floor-Mounted Bottom Offset Pivot
(Source: Courtesy of Scott J. Tobias)

Intermediate Pivot

Offset intermediate pivots are not only recommended to be specified and installed when using a top and bottom offset pivot, they are required by some manufacturers. Offset intermediate pivots have the same standard pivot point as a top and bottom pivot set, which is 3/4 inch, which means the pivot point, or center of the pivoting portion of the pivot, is 3/4 inch from the face of the door and are handed either left hand or right hand. Intermediate offset pivots are also available in special offset dimensions; the most common extended offset dimension is 1 1/2 inches, which is typically used to accommodate a



FIGURE 1.84 Intermediate Offset Pivot
(Source: Courtesy of Scott J. Tobias)



FIGURE 1.85 Offset Top Pivot Arm
(Source: Courtesy of Rixson®)

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panel on the face of the door. If an extended offset is not furnished for a panel on the face of the door, the pivot point would conflict with the panel, and that portion of the panel would have to be cut out to accept the pivot point and arm.

Be careful when specifying extended pivots, as the more the extension, the less weight the pivot will hold due to the balance and placement of the arm underneath the door.

Intermediate offset pivots must adhere to the same codes for hanging doors and butt or continuous hinges and can be used as a set of three or more instead of top and bottom pivots, similar to butt hinge applications.

LIGHTWEIGHT

Lightweight hinges are typically used for very light-duty, low-use door openings that can be mounted in different mountings such as floor to stop, floor to ceiling, and jamb to ceiling.

Top Pivot

OFFSET

An offset top pivot is typically manufactured with two arms that meet at one end and are attached with a pin of sorts, similar to a scissor, which rotates or "pivots" two parts on each other. This allows a door to swing open and closed from a frame or door opening.

CENTER

A center-hung top pivot is also known as a walking-beam pivot and has a retractable pin that allows the door to be installed into the frame. When installing, the pin is retracted until in place and then extended to secure the door into the opening.

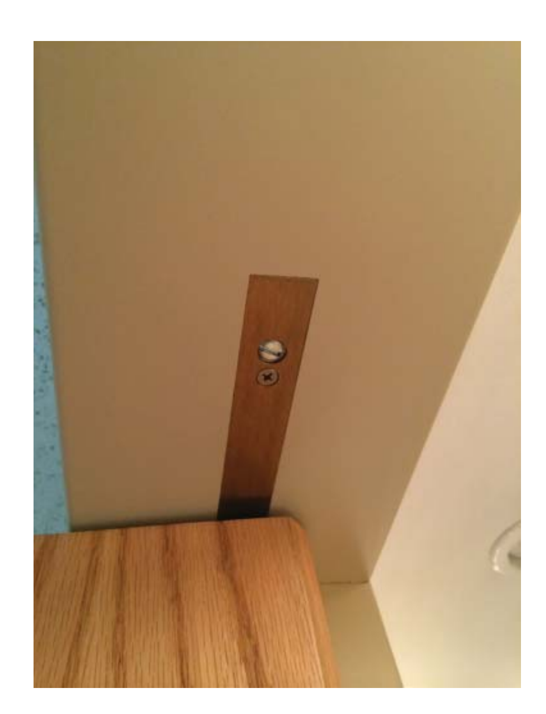


FIGURE 1.86 Center Bottom Pivot Arm
(Source: Courtesy of Rixson®)

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Spring

Surface-mounted pivots are typically similar to light-duty center-hung pivots, and although they swing the door closed, they cannot be used on fire rated doors. They are installed in the center of the thickness of the door, can hold moderate weight doors, typically swing the door in both directions (similar to a kitchen-type door in a restaurant), and bring the door back to the center of the frame in the closed position. Spring pivots typically come in sets, which include a top and bottom pivot.

They are also installed slightly offset in the thickness of the door, which means that the back end of the door swings into the opening, depending on the pivot and template, approximately 6 inches. This means that the frame cannot have a stop on it, at least not on the pivot side of the door if the door is meant to be single acting.

One thing to be cautious of is the clearance at the edges of the door. Because the pivot is offset in the thickness of the door and the door swings through the frame on the back end, there is a more than normal clearance, which allows for light to shine through the edges. It is recommended in most cases to use some type of gasketing around the perimeter of the door, typically a brush-type seal.

Gate and gravity pivot hinges are also available, specifically manufactured to operate gates and not doors that are not full height in a door opening.

Also known as dwarf or small door spring hinges, screen hinges are small devices used for very lightweight doors, such as an aluminum screen or window panel door.

The torsion door spring hinge typically has two plates and a thick pin of sorts connecting the two, with a heavy-duty spring wrapped around the pin. Tension is created when the plates separate, which are installed on the door and the frame or door opening.

Thrust

Similar to an anchor and pivot reinforced hinge, a thrust pivot hinge has a pivot set at the top of the door that continues to the jamb of the door, so in sense is a top pivot, but requires the use of butt hinges to complete the installation.

OPTIONS

Electric Transfer

Pivots are available with wires running through them, and electric transfer pivots are available for electric locking or release devices. An electrified lockset on a single door or pair of doors or an electric strike on a pair of doors requires a device that would transfer the power from the wall into the pivot leaf on the frame, through the pivot point of the pivot and leaf on the door, then across the door to the electric device.

Depending on the function of the electrified system on the door opening, electric transfer pivots are available with various wire quantities. A simple system would only require four wires, while a more complex system or one with added options, such as a signal switch, might require as many as 12 wires.

Also, electric transfer pivots are intended to operate with low-voltage and low-amperage devices. If the voltage or amperage is too high, there is a danger of overheating and damaging the devices and those

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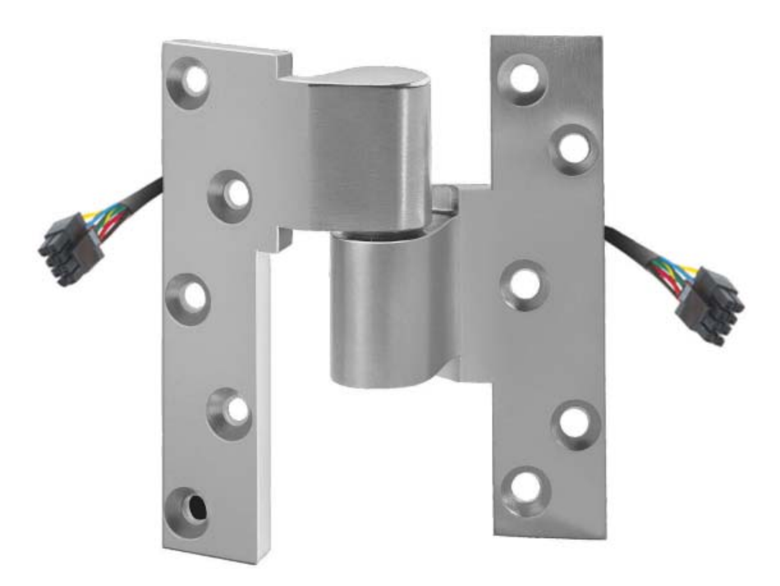


FIGURE 1.87 Electric Transfer Intermediate Pivot
(Source: Courtesy of Rixson®)

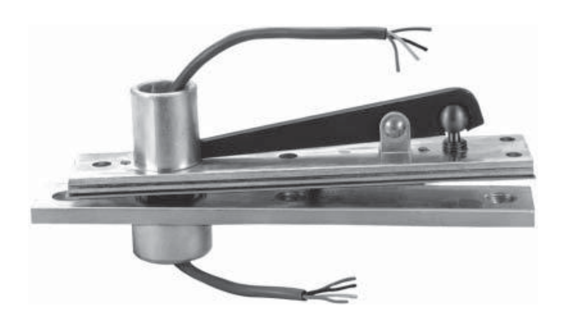


FIGURE 1.88 Electric Transfer Center Top Pivot
(Source: Courtesy of Rixson®)

that they operate, and it creates the danger of a fire. If the devices do require higher voltage, a power transfer device is required (see Chapter 10, Miscellaneous Items).

Some manufacturers furnish electrified transfer pivots with nonproprietary Molex connectors, which are plastic connectors that are coordinated with the electrified hardware and power supplies. This allows all of the company's electrified devices to be manufactured with Molex connectors, allowing any two devices to quickly and easily snap together, much like a plug-and-play device on your computer.

Extended Offset

The standard offset pivot point is 3/4 inch, and although available in custom dimensions, the most common extended offset dimension is 1 1/2 inches. The extended offset is typically used to accommodate a panel or plant-on, on the face of the door. If a 3/4-inch panel is installed on a door and an extended offset is not used, the pivot point would conflict with the panel and that portion of the panel would have to be cut out to accept the pivot point and arm.

Be cautious when specifying extended pivots, as the more the extension, the less weight the pivot will hold due to the balance and placement of the arm underneath the door.

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Extended Spindle

Extended spindles for the bottom arms and floor plates are available for doors that have large undercuts in order to extend the entire length required. A typical door undercut is 3/4 inch from the finished floor, which is what a standard spindle is manufactured for. Another reason why an extended spindle might be required is a panel or covering on the door or a taller than normal saddle on the floor, which would require the spindle to extend through either.

Fire Rated

Offset pivot sets have the option of being manufactured as fire rated but have to be specified and ordered as such. This means the material is steel or stainless steel and has been tested and passed as fire rated by Underwriters' Laboratories (UL).

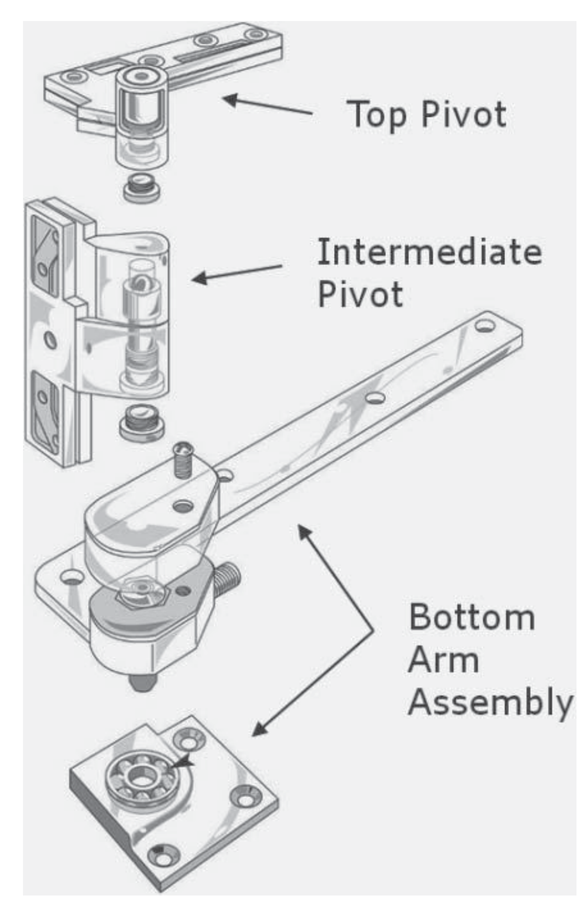


FIGURE 1.89 3/4-Inch Offset Pivot Set
(Source: Courtesy of Rixson®)

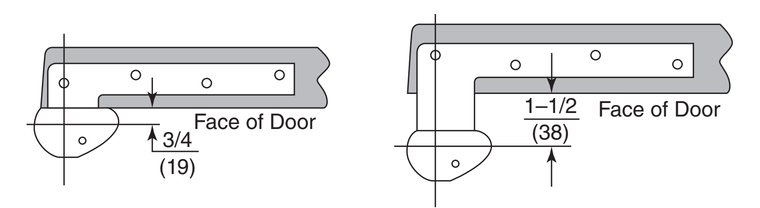


FIGURE 1.90 Various Offsets
(Source: Courtesy of Rixson®)

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Institutional Design

Similar to hospital tip hinges (see Hanging Means, Hinges, Options, Hospital Tip in this chapter), institutional design pivots are designed to eliminate the conventional flat portion of the device where the two ends join and pivot. The end is rounded and makes it more difficult to tie or wrap something around the end with the intention to harming oneself.

Lead Lined

Offset pivot sets are not actually lead lined, but the fastener hole pattern on each leaf is set in a way so as not to interfere with the lead lining of a door and frame. If the fasteners were to penetrate the lead lining in either the door or frame, it would create a hole in the lead and radiation could escape through the hole to the other side of the opening, where the protection for those passing by would be eliminated.



FIGURE 1.91 Lead Lined Top Offset Pivot Arm
(Source: Courtesy of Rixson®)

Less Top Pivot

There are some conditions that might not allow the use of a top offset pivot, although the intermediate and bottom pivots would be optimal for the application. An arched doorway would be one example where a top pivot could not be installed due to the configuration of the top of the door and frame, so the pivot set would be specified "less top pivot."

Special Layouts

Some installations require custom layouts and some manufacturers are willing to work with you to see if they have the ability to customize their tooling to create pivot configurations as required.

Weights

Pivots are not categorized in grades as with most architectural hardware, but in weights such as light, medium, and heavy.

With that said, pivots can be manufactured with different quality levels, depending on the source and factory and possibly country standards.

Some manufacturers still manufacture pivots in the United States, which are typically of superior quality to those manufactured in some other countries, known in the industry as imports.

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Imports are available in the most typical and widely used sizes, typically for 3-foot-wide, 7-foot-high, and 1 3/4-inch-thick wood or metal swinging doors. The pivots are less expensive than those still made in the United States, and the lower quality can sometimes be noticed with ragged edges, poor finishes, and not optimal performance.

Due to the competitive nature of the door opening industry, some of the U.S. manufacturers now sell products at the same level and price point of these pivots to compete on projects through the distribution marketplace.

LIGHTWEIGHT

Lightweight pivots would not typically be used on a commercial application but more likely on a residential or an infrequently used door.

MEDIUM/STANDARD WEIGHT

Medium-weight pivots would typically be used on standard-frequency openings with the ability to carry standard door weights from 150 and up to 650 pounds, depending on the manufacturer.

HEAVYWEIGHT

Heavyweight pivots would typically be used on standard-frequency openings with the ability to carry standard door weights from 1,000 and up to 1,750 pounds depending on the manufacturer.

QUANTITIES

Pivots are typically installed in set, depending on their type, although some are available as singles to be combined as necessary for the application.

CENTER

Center pivot sets are typically available with a top and bottom pivot. Because the door is hung balanced in the opening, there is no accommodation nor is there any available type of intermediate center pivot; they are only available for offset pivots. Remember, because of the door and frame configuration for a center pivot, the opening cannot be fire rated.

OFFSET

Offset pivot sets are typically available with a top and bottom, although an intermediate pivot is required by most manufacturers for use with the top and bottom set. Offset pivoted doors have the same requirements as standard hinges—two per leaf for openings through 60 inches to door height. One additional pivot required per leaf for each additional 30 inches in height or fraction thereof, and four pivots for Dutch doors up to 90 inches in height. You might ask why four hinges are used for a Dutch door. A Dutch door is a split-leaf door that has a top half and bottom half that swing independently from each other. In order for the doors to swing at all, they need at least two pivots each.

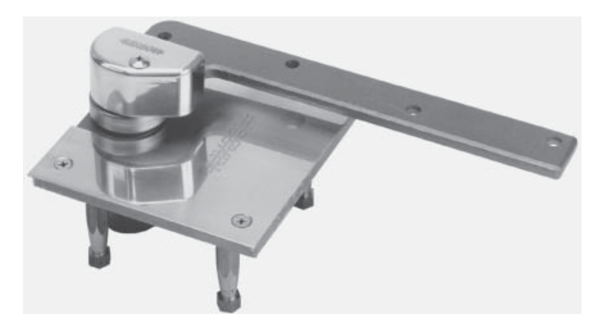


FIGURE 1.92 Heavyweight Offset Pivot Set
(Source: Courtesy of Rixson®)

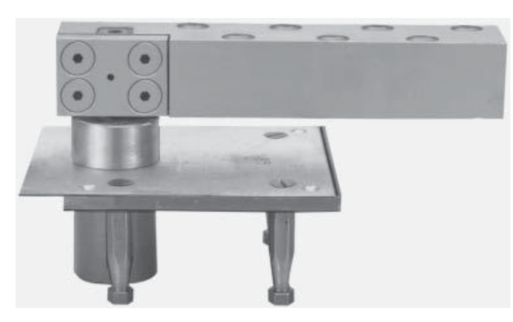


FIGURE 1.93 Heavyweight Center Pivot Set
(Source: Courtesy of Rixson®)

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POCKET

A pocket-pivot set typically uses single pivots. Pocket-pivot doors have the same requirements as standard hinges and are installed at the edge of the door, but some manufacturers require more pivots than codes require. The minimum is three pivots per opening, no matter the minimum height, four for 7-feet, 6-inch door heights, and one additional pocket pivot per leaf for each additional 30 inches in height or fraction thereof.

APPLICATIONS

Similar to hinges, some applications will not allow for conventional mortising of the pivot arms on either the door or frame or both. Therefore, other application variations are available to accommodate other necessary mountings.

Center

Center-hung pivots are the next most recommended pivot type after offset pivots, but they cannot be used on fire rated doors. They are installed at the centerline of the thickness and off of the edge of the door and are not handed. Center pivots can be used for single-acting applications, such as one with a conventional door swing, or for double-acting applications, such as you might see in a restaurant on a kitchen door for easy access in either direction. Just as a door edge is beveled for other hanging means so the door edge does not bind with the frame edge, a center-hung door has a bull-nosed, or radius edge, to allow the door to swing through the opening without binding (see Figure 1.94). The radius at the edge of the door creates a larger than standard clearance, which allows light to shine through the edges. It is recommended in most cases to use some type of gasketing around the perimeter of the door, typically a brush-type seal.

Because center pivots are installed at the centerline of the thickness and off of the edge of the door, the back end of the door swings into the opening and to the other side (see Figure 1.94). If being used on a



FIGURE 1.94 Double Lipped Strike with Built-In Emergency Stop
(Source: Courtesy of Scott J. Tobias)

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single-swing application, due to the fact that the door needs to swing through the opening on the back end, the frame cannot have a full-stop across the top to stop the door in the closed position. The stop on the frame can either be manufactured to end where the pivot starts or an applied angle stop can be used instead (see Chapter 7, Stops and Holders).

Center pivots can hold the weight of very large and oversized doors and, if installed correctly, they can swing the door freely and make it appear as if it were quite light weight when swinging open or closed. Light-duty center pivots are also available, although they do not have the same strength and durability as conventional commercial types.

RESCUE HARDWARE

Typically used on a healthcare restroom, center pivots are often part of a rescue hardware set, which includes a center pivot that swings both ways through an opening. Other parts of the rescue hardware set include a double-lipped strike plate, which extends the entire width of the frame jamb. An emergency release stop is another part of the rescue hardware set, which is used to stop the door in the closed position in the frame or door opening. When a patient is in the restroom and happens to get injured, falls, or is unable to get out by themselves but are resting against the in-swinging door, the emergency stop can be depressed and the door can be swung toward the rescuers you and away from the patient, who can then be assisted.

Full Surface

Typically available for top pivots, the designation in the device title refers to the door portion of the opening. The door and frame portions of the pivot are surface-mounted on the faces of the door and frame.

Half Mortise

Typically available for top pivots, the designation in the device title refers to the door portion of the opening. The door portion of the pivot is mortised as a conventional top pivot would be, while the frame portion is surface-mounted on the face of the frame.

Half Surface

Typically available for top pivots, the designation in the device title refers to the door portion of the opening. The door portion of the pivot is surface-mounted on the face of the door while the frame portion is mortised as a conventional top pivot would be.

Offset

Offset hung pivots are the number one recommended pivot configuration due to their application availability, strength, durability, and longevity; however, they do tend to be the most expensive conventional hanging means other than offset floor closers. Offset pivots are handed, which means they need to be specific to the handing of the door, right or left.

Offset pivots have a standard pivot point of 3/4 inch, which means the pivot point, or center of the pivoting portion of the arm, is 3/4 inch from the face of the door. This pivot point or spindle is typically covered by a cap that is held onto the spindle with a screw. Offset pivots are also available in special offset dimensions; the most common extended offset dimension is 1 1/2 inches, which is typically used to accommodate a panel on the face of the door, similar to a wide throw hinge (see Pivots, Options, Extended Offset and Hinges, Types, Wide Throw in this chapter).

Offset pivots must adhere to the same standards and fire codes for hanging doors as standard or continuous hinges, and it is not only recommended but required that an intermediate pivot be used when

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installing top and bottom offset pivots (see Pivots, Intermediate in this chapter). Light-duty offset pivots are also available, although they do not have the same strength and durability as conventional commercial types.

Patch Fittings

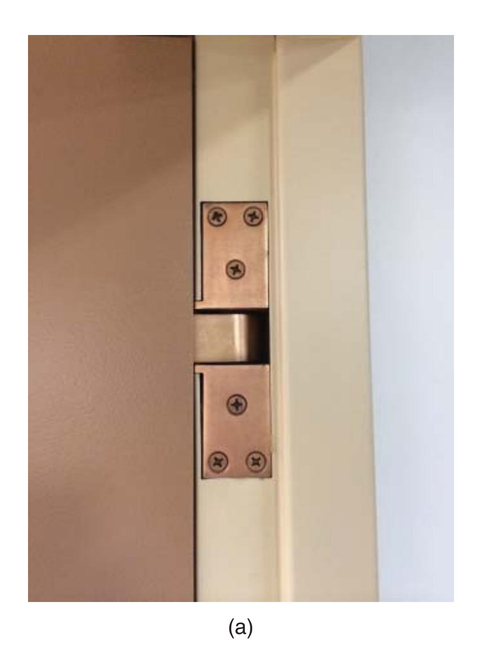
Typically available for both top and bottom pivots, patch fittings are available for glass doors without top and or bottom rails to accommodate conventional pivot arms. Patch fittings are attached to both sides of the glass, sandwiching it in between. Coordinating the glass thickness with the patch fitting is necessary to ensure the glass will fit into the patch fittings properly or at all.

Pocket

Similar to swing clear standard and continuous hinges, pocket pivots are used for swinging a door away from the clear width opening. A typical application for a pocket-pivot hinge is to swing the door into a pocket in the wall so that the door appears flush with the surrounding wall, appearing to become part of the wall, which some might find more aesthetically pleasing. This application is typically used



FIGURE 1.95 Patch Fitting Bottom Pivot
(Source: Courtesy of Rixson®)



(a)

FIGURE 1.96a Open Pocket Pivot
(Source: Courtesy of Scott J. Tobias)



(b)

FIGURE 1.96b Closed Pocket Pivot
(Source: Courtesy of Scott J. Tobias)

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in cross-corridor fire rated doors, which are held open on electromagnetic holders and tied into a fire alarm system (see Chapter 7, Stops and Holders).

Pocket pivots must adhere to the same standards and fire codes for hanging doors as standard or continuous hinges.

INSTALLATION

The most efficient type of hanging device is the pivot. This hardware allows the door's weight to be borne by the floor and not on the frame. The result is virtually no stress on the frame.

The mounting screws are in shear, not tension. This means for the door to come off the frame, the heads of the screws would have to be sheared off horizontally and the door would have to be lifted off the floor portion of the pivot set. Pivot sets are available offset or center hung.

Fasteners

Pivots are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat head are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Pivots are installed on different points of the door, frame, and floor, depending on the type and application (see Hanging Means, Pivots, Quantities in this chapter).

Preparations

Pivot preparations vary by type and application and are typically reinforced with additional materials inside the door to assist with the screw holding force.

Screw holes are typically drilled and tapped at the factory for metal doors, but not for wood doors unless specifically requested. Expect a costly up-charge when requesting factory drilling and tapping. Similar to a standard hinge, when using a heavyweight pivot, thicker gauge metal means that the materials will be thicker and the door and frame preparations need to be coordinated.

FLOOR CLOSERS

Also Known As: Floor Check, Concealed Closer

Equal to pivots as the most efficient type of hanging device is the floor closer, and some may even consider it even more efficient with the addition of the self-closing ability. This hardware allows the door's weight to be borne by the floor and not on the frame. The result is virtually no stress on the frame.

Floor closers can be manufactured as various types to accommodate different door sizes, thicknesses, weights, existing floor conditions, and fire ratings and are available for various types of special applications such as oversized doors and or door and frame applied materials.

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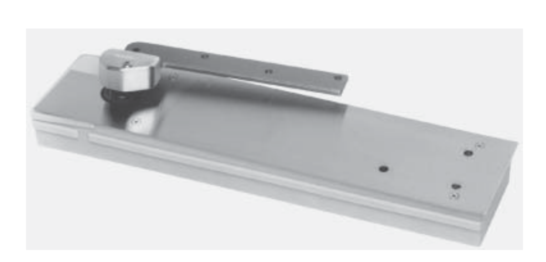


FIGURE 1.97 Shallow Floor Closer
(Source: Courtesy of Rixson®)

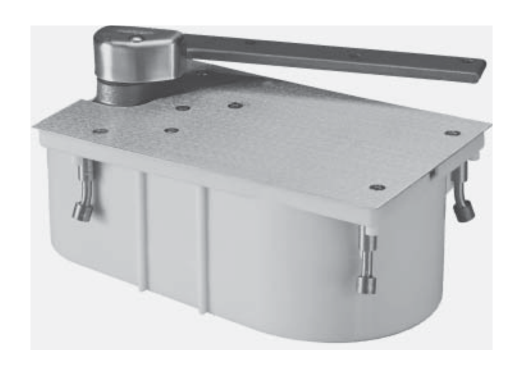


FIGURE 1.98 Heavy-Duty Floor Closer
(Source: Courtesy of Rixson®)

PROPERTIES

Floor closers are typically furnished in sets with a top pivot and floor closer body, which are installed at the top and bottom of the door and connected to the head of the door opening or frame and in the floor directly beneath.

Bearings

Floor closers that are manufactured with bearings help support the weight and operation of the device. They also keep the arm of the floor closer and the spindle from directly touching and pivoting on each other. This creates a supportive barrier between the metal parts, reducing metal friction, which causes less wear and a smoother operation.

THRUST BEARING

Thrust bearings help support the weight or vertical load of the door, or the weight resting on top of the bottom arm and floor closer arm. The thrust bearing level of duty will match that of the floor closer; for example, a heavy-duty floor closer will have a heavy-duty thrust bearing.

NEEDLE BEARING

Needle bearings help support the lateral force of the opening, or the swinging from side to side on the pivot point.

OIL-IMPREGNATED BEARING

Oil-impregnated bearings help support the movement of the walking beam pivot when it is being installed and uninstalled.

Finishes

Floor closer bodies do not have finishes, as they are covered beneath the ground. They are typically furnished with cover plates that are available in most architectural hardware finishes to match the other hardware installed on the door such as the locking device.

Grades

Door closers, including floor closers, are graded with grades 1, 2, or 3, depending on ANSI/BHMA test procedures. Such tests include cycle and various valve testing to meet minimum levels. Minimum levels, for example, for a surface or concealed in door cycle testing for a grade 1 closer are 1 million cycles and 100,000 cycles with the backcheck valve control functional.

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Materials

The internal parts and decorative cover plates of floor closers are manufactured from various metals, depending on the manufacturer. The arms are manufactured from brass, bronze, stainless steel, or steel, depending on their application and fire rated door opening requirements. If a door opening is fire rated, the codes state that hanging devices must be manufactured of steel to withstand the high temperatures of a fire.

If anything other than a steel base is installed on a fire rated door opening and a fire occurs, the hinge metal might melt enough to cause the opening to fail, allowing the fire to spread from one side of the opening to the other.

Springs

CAM

A cam action closer operates by a twisting motion, which pushes and pulls the springs that operate with the closer opening and closing cycles. A cam action closer is different from a standard closer where a standard closer does not have a twisting part, but rather hydraulic fluid that flows back and forth through the device, pushing and pulling the parts that are required to move the closer through the cycles.

TORSION

A torsion spring is a wound spring, where the tension is in the wind rather than in compressing or squeezing. The spring is wound and has tension in the same direction as the door swing, which helps with efficiency and operation of the door.

COMPRESSION

A compression spring is compressed or squeezed and released to create the movement necessary to close a door and is not as efficient as a torsion spring (see Hanging Means, Floor Closers, Options, Springs in this chapter).

Stops

Some floor closers have built-in stops, which hard-stop the door at a set degree of opening. The opening degree is typically limited and depends on the manufacturer's availability.

Valves

Floor closers are manufactured with various valves to assist with optimizing the closing and latching speeds and forces. These valves act in cycles of the door opening and closing.

BACKCHECK

Backcheck valves allow for adjustment to the opening force past about 65 degrees of the door in the open position to give the door less resistance, making it easier to push open.

CLOSING SPEED

Closing speed valves allow for adjustment of the closing speed cycle. This is the speed once initially released if the device has no delayed action option (see Hanging Means, Floor Closers, Options in this chapter) or once the delayed action has completed, and affects the closing up until about 15 degrees of the closed position.

LATCH SPEED

Latch speed valves allow for adjustment to the latching speed cycle. This is the speed once past the closing speed cycle and gives the door enough force and power to clear any of the locking device

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latches, or other surrounding elements that might affect the closing such as gaskets around the perimeter of the door.

TYPES

The bodies of a floor closer typically come in two depths. In addition to the floor closer body sizes and depths required for installation, there are many feature differences.

Heavy Duty

Heavy-duty applications require a preparation in the floor of more than 4 inches deep and can carry standard weights up to approximately 450 pounds with extra-heavy-duty applications, carrying weights up to 1,500 pounds.

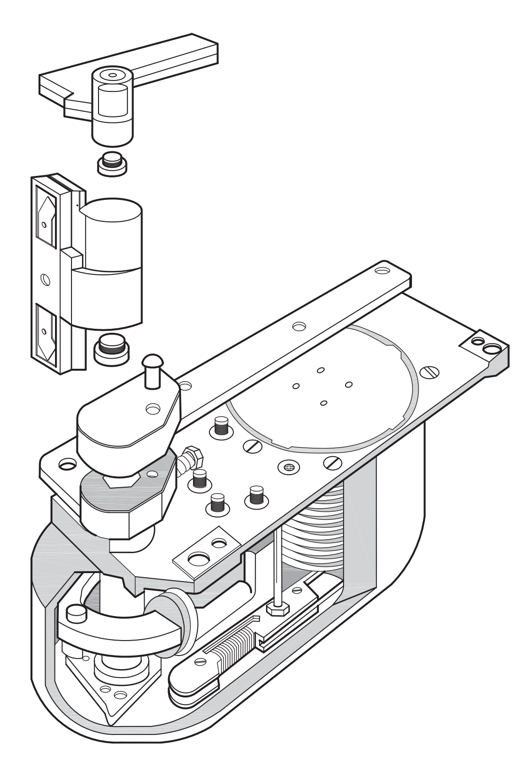


FIGURE 1.99 Heavy Duty Floor Closer
(Source: Courtesy of Rixson®)

Shallow Depth

The body of a floor closer can be standard duty and requires a preparation in the floor of about 2 inches deep, carrying weight up to approximately 250 pounds.

OPTIONS

Cold Weather Fluid

Cold weather fluid is available in lieu of standard oil and fluids used to operate the floor closer. This fluid would be specified and used in areas where extreme cold weather exists so that the fluids do not thicken or freeze, which would affect the operation of the closer.

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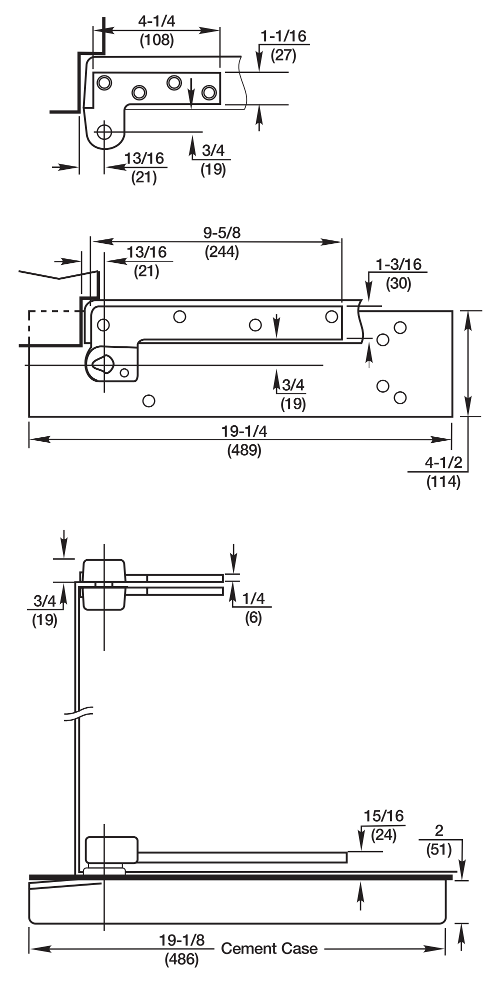


FIGURE 1.100 Shallow Depth Floor Closer
(Source: Courtesy of Rixson®)

Cover Pan

Floor closers are available with cover pans to be installed where the standard decorative cover plate would be. A cover pan would likely be used for the installation of terrazzo or some type of floor

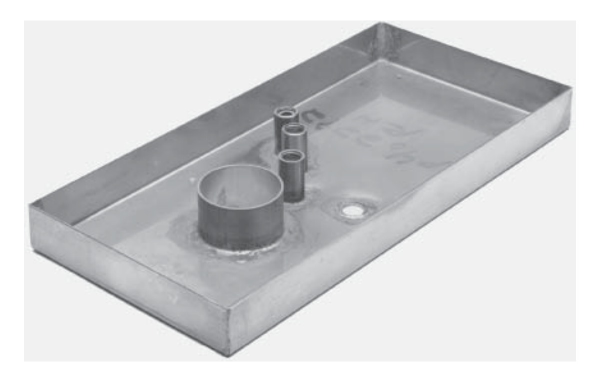


FIGURE 1.101 Floor Closer Cover Pan
(Source: Courtesy of Rixson®)

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covering, which would be installed into the pan, then the pan would be installed into the floor. The materials would match the surrounding patterns with the exception of a narrow metal lip of the pan, which can be removed from the floor for access to the floor closer. Access might be required for spring or tension adjustments or for other types of required repairs or replacement. Depending on the pan and material dimensions, an extended spindle might be necessary (see Hanging Means, Floor Closers, Options, and Extended Spindles in this chapter).

Delayed Action

A delayed-action option delays, or slows, the door and sometimes even hold it for a short period of time at a certain degree. This option allows time for someone or something to pass through the doorway without rushing or getting hit by the door while moving through the opening, without the need for a hold-open feature (see Hanging Means, Floor Closers, Options, Hold Open in this chapter).

Electric Transfer

Floor closers are available with wires running through them, and electric transfer pivots are available for electric locking or release devices. An electrified lockset on a single door or pair of doors or an electric strike on a pair of doors would require a device, which would transfer the power from the wall into the floor closer body, through the spindle, up the hanging side of the door to the raceway, and across the door to the electric device.

Depending on the function of the electrified system on the door opening, electric transfer pivots are available with various wire quantities. A simple system would only require four wires, while a more complex system or added options, such as a signal switch, might require twelve wires.

In addition, electric transfer pivots are intended to operate with low-voltage and low-amperage devices. If the voltage or amperage is too high, there is a danger of overheating and damaging the devices and those that they operate, and this creates the danger of a fire. If the devices do require higher voltage, a power transfer device is required (see Chapter 10, Miscellaneous Items).

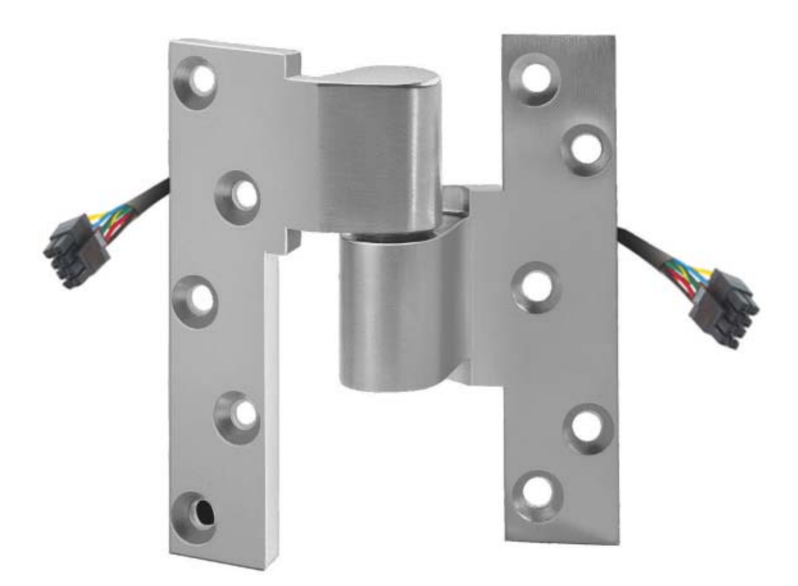


FIGURE 1.102 Electric Transfer Intermediate Pivot
(Source: Courtesy of Rixson®)

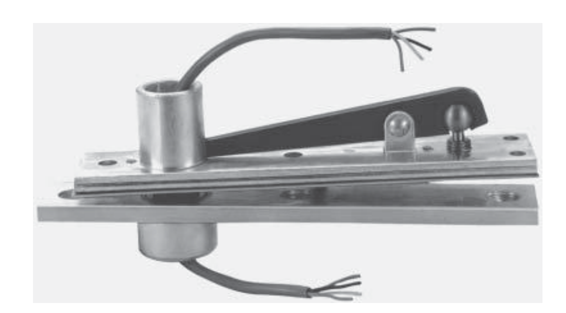


FIGURE 1.103 Electric Transfer Center Top Pivot
(Source: Courtesy of Rixson®)

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Some manufacturers furnish electrified transfer pivots with nonproprietary Molex connectors, which are plastic connectors that are coordinated with the electrified hardware and power supplies. This allows all of the company's electrified devices to be manufactured with Molex connectors, allowing any two devices to quickly and easily snap together like a plug-and-play device on your computer.

Extended Offset

The standard offset floor closer pivot point is 3/4 inch, and although available in custom dimensions, the most common extended offset dimension is 1 1/2 inches. The extended offset is typically used to accommodate a panel or plant-on, on the face of the door. If a 3/4-inch panel is installed on a door and an extended offset is not used, the pivot point will conflict with the panel and that portion of the panel will have to be cut out to accept the pivot point and arm.

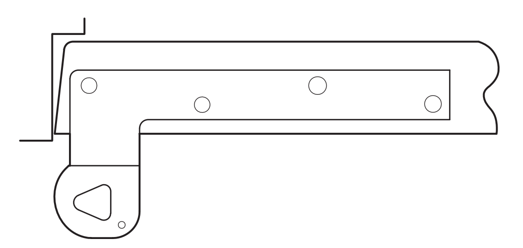


FIGURE 1.104 Extended Floor Closer Arm
(Source: Courtesy of Rixson®)

Be cautious when specifying extended floor closer pivot points, as the more the extension, the less weight the floor closer will hold due to the balance and placement of the arm underneath the door.

Extended Pivot Pin

Center floor closers using top-center pivots sometimes require longer pivot pins in order to engage the door more than a standard pivot pin. This option is recommended when doors are taller than a certain height, but as with all door hardware, check with the manufacturer's recommendations.

Extended Spindle

Extended spindles for the bottom arms and floor plates are available for doors that have large undercuts in order to extend the entire length required. A typical door undercut is 3/4 inch from the finished floor, which is what a standard spindle is manufactured for. Another reason why an extended spindle might be required would be a panel or covering on the door or a taller than normal saddle on the floor, which would require the spindle to extend through either.

Fire Rated

Offset floor closers have the option of being manufactured as fire rated, but have to be specified and ordered as such. This means the material is steel or stainless steel and has been tested and passed by the UL as fire rated and might require additional intermediate pivots to comply.

Hold Open

The hold open option is available to hold the floor closer and door in the open position, which is a fixed degree of opening. The hold open positions can vary depending on availability and cannot be used on fire rated doors, as they are mechanical hold open devices.

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Lead Lined

Offset floor closers are not actually lead lined, but the fastener hole pattern on each leaf is set in a way so as to not interfere with the lead lining of a door and frame. If the fasteners were to penetrate the lead lining in either the door or frame, it would create a hole in the lead and radiation could escape through the hole to the other side of the opening, where the protection for those passing by would be eliminated.

Fewer Parts

Floor closers typically have the option to be specified as fewer of certain parts such as the floor plate, top pivot, or possibly all parts except for the body alone. This might be desired if you wanted to order and install a replacement part of the closer or the closer body itself without having to pay for or waste the other parts of the closer.

Non-Hold Open

The non-hold open option is available so that the door is not held open and closes each time. It is typically used on fire rated doors.

Physically Handicapped

This option indicates the opening force complies with ICC/ANSI A117.1 (International Code Council/American National Standards Institute) Accessible and Usable Buildings and Facilities, 2009 and the ADA Accessibility Guidelines for Buildings and Facilities (ADAAG). These standards require that any accessible opening have a 5-pound maximum opening force. This option cannot be used on fire rated or exterior door openings, whose requirements override accessible codes and standards. Be aware that this option reduces the opening force, which in turn reduces the closing force, and might prevent the door from closing and latching properly or at all (see Hanging Means, Floor Closers, and References in this chapter).

Sealed Closer

For door openings that have exposure to water or liquids, such as cleaning products, sealing a closer protects the inside of the closer body and all of the working parts of the floor closer. In order to seal the floor closer, it is typically placed in a cement case and a gasket is placed in between it and the secured cover plate, which is fastened to the cement case containing the floor closer body.

Selective Hold Open

The selective hold open option is available to hold the floor closer and door in the open position, which can be selected to achieve different degrees of opening. The hold open positions can vary depending on availability and cannot be used on fire rated doors, as they are mechanical hold open devices.

Special Layouts

Some installations require custom layouts and some manufacturers are willing to work with you to see if they have the ability to customize their tooling to create pivot configurations as required.

Threshold

Some manufacturers offer thresholds to cover the floor closer in lieu of the standard decorative cover plate and or cover plate for terrazzo or other floor coverings. Thresholds might be required by some

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codes for floor type transitions and when using a floor closer in those opening types, having the threshold furnished by the same manufacturer as the floor closer would be the best option.

QUANTITIES

Floor closers are typically installed in sets, depending on their type, although some are available as parts as necessary for the application.

Center

Center floor closers are typically available with a floor closer body, arm, top pivot, and decorative plates. Because the door is hung from the top and bottom, there is no such thing as a center hung intermediate pivot. With its operation and configuration, there is no physical way for the door to attach to the frame or framed opening hardware at the middle edge of the door. Also remember, center hung openings are typically not fire rated.

Independently Hung

Independently hung floor closers can be sold as just a floor closer body to work with another hanging means to be specified such as hinges or pocket pivots. These floor closers can also sometimes be sold in sets, depending on the manufacturer, such as a floor closer body with two standard hinges.

Offset

Offset floor closers are typically available with a floor closer body, arm, top pivot, and decorative plates. Although an intermediate pivot is required by most manufacturers for use with the offset floor closer

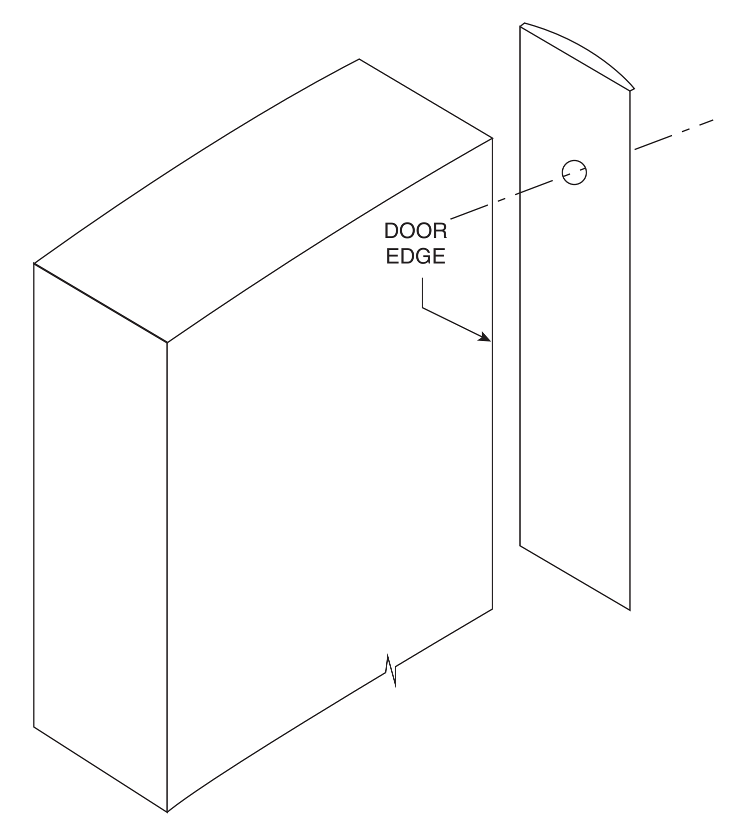


FIGURE 1.105 Radius Edge Door
(Source: Courtesy of Ceco Door)

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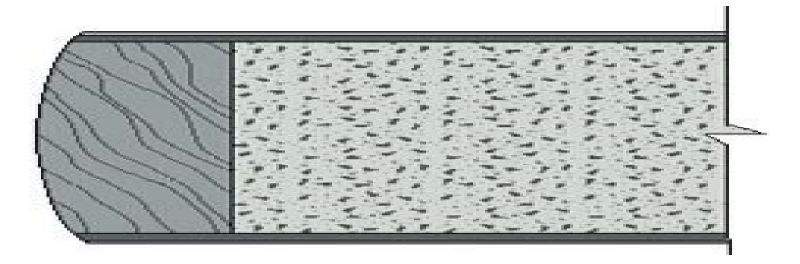


FIGURE 1.106 Center Pivot Point
(Source: Courtesy of Rixson®)



FIGURE 1.107 Independently Hung Floor Closer
(Source: Courtesy of Rixson®)

and top pivot, it does not typically come with the set and needs to be specified or ordered separately. Offset pivoted doors have the same requirements as standard hinges—two per leaf for openings through 60 inches to door height. One additional pivot is required per leaf for each additional 30 inches in height or fraction thereof.

APPLICATIONS

Similar to hinges, some applications will not allow for conventional mortising of the pivot arms on either the door or frame or both. As such, other application variations are available to accommodate other necessary mountings.

Center

Center hung floor closers are the next most recommended hanging means after offset floor closers (see Hanging Means, Floor Closers, Properties, and Offset in this chapter). Center floor closers cannot be used on fire rated doors, as they are installed at the centerline of the thickness and off of the edge of the door. Center hung floor closers can be used for single-acting applications, such as a conventional door swing or double-acting applications such as you might see in a restaurant on a kitchen door for easy access in either direction. Just as a door edge is beveled for other hanging means so the door edge does not bind with the frame edge, a center hung door has a bull-nosed, or radius, edge to allow the door to swing through the opening without binding (see Figure 1.135). The radius at the edge of the door creates a larger than standard clearance, which allows light to shine through the edges. It is recommended in most cases that you use some type of gasketing around the perimeter of the door, typically a brush-type seal.

Because center floor closers are installed at the centerline of the thickness and off of the edge of the door, the back end of the door swings into the opening and to the other side (see Figure 1.105). If being used on a single-swing application and due to the fact that the door needs to swing through the opening on the back end, the frame cannot have a full stop across the top to stop the door in the closed position. The stop on the frame can either be manufactured to end where the center pivot starts or an applied angle stop can be used instead (see Chapter 7, Stops and Holders).

Full Surface

Typically available for top pivots, the designation in the device title refers to the door portion of the opening. The door and frame portions of the pivot are surface-mounted on the faces of the door and frame.

Half Mortise

Typically available for top pivots, the designation in the device's title refers to the door portion of the opening. The door portion of the pivot is mortised as a conventional top pivot would be, while the frame portion is surface-mounted on the face of the frame.

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Half Surface

Typically available for top pivots, the designation in the device title refers to the door portion of the opening. The door portion of the pivot is surface-mounted on the face of the door while the frame portion is mortised as a conventional top pivot would be.

Independently Hung

Typically handed left or right, an independently hung floor closer is a closer concealed in the floor and only functions as a door closer and not to carry the weight of the door. This closer requires the use of hinges, continuous hinges, or pocket pivots to hang and carry the weight of the door. The type of hanging devices will have to be specified when ordering the floor closers so that the installation is templated properly.

Offset

Offset floor closers are the number one recommended pivot configuration due to their application availability, strength, durability, and longevity; however, they do tend to be the most expensive conventional hanging method. Offset floor closers are handed, which means they need to be specific to the handing of the door, right or left.

Offset floor closers have a standard pivot point of 3/4 inch, which means the pivot point, or center of the pivoting portion of the arm, is 3/4 inch from the face of the door. This pivot point, or spindle, is typically covered by a cap that is held onto the spindle with a screw. Offset floor closers are also available in special offset dimensions; the most common extended offset dimension is 1 1/2 inches, which is typically used to accommodate a panel on the face of the door, similar to a wide throw hinge (see Hanging Means, Floor Closers, Options, Extended Offset and Hinges, Types, Wide Throw in this chapter).

Offset floor closers must adhere to the same standards and fire codes for hanging doors as standard or continuous hinges. It is not only recommended, but required, that an intermediate pivot is used when installing top and bottom offset pivots (see Hanging Means, Pivots, Intermediate in this chapter).

Patch Fittings

Typically available for a floor closer set, including a floor closer body and top pivot, patch fittings are available for glass doors without top and or bottom rails to accommodate conventional floor closers

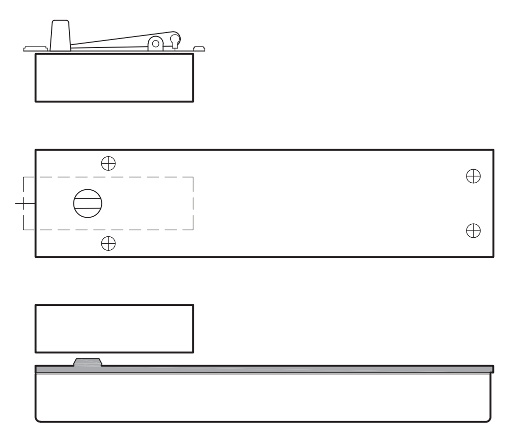


FIGURE 1.108 Patch Fitting Floor Closer
(Source: Courtesy of Rixson®)

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and pivot arms. Patch fittings are attached to both sides of the glass, sandwiching it in between. Coordinating the glass thickness with the patch fitting is necessary to ensure the glass will fit into the patch fittings properly.

INSTALLATION

Equal to if not more efficient than a pivot, a floor closer is the ideal hanging and controlling device. This hardware allows the door's weight to be borne by the floor and not on the frame, resulting in virtually no stress on the frame.

Be aware, however, that although a floor closer will stop a door when the spring reaches full tension, the floor closer will stop working efficiently, as it is not meant to stop the door. Some floor closers actually have stops built into them, but otherwise an additional stop will need to be installed (see Stops and Holders in Chapter 7).

The mounting screws are in shear, not tension. This means for the door to come off the frame, the heads of the screws would have to be sheared off horizontally and the door would have to be lifted off the floor portion of the floor closer.

It is recommended to install overhead stops on out-swinging doors hung on floor closers, especially on exterior heavy duty applications.

Fasteners

Floor closers are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

The mounting screws are in shear, not tension. This means for the door to come off the frame, the heads of the screws would have to be sheared off horizontally and the door would have to be lifted off the floor portion of the floor closer arm. Floor closers are available in offset or center hung options.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Floor closers are installed on different points of the door, frame, and floor, depending on the type and application (see Hanging Means, Floor Closers, Quantities in this chapter).

Preparations

Floor closer preparations vary by type and application and are typically reinforced with additional materials inside the door to assist with the screw holding force.

Screw holes are typically drilled and tapped at the factory for metal doors, but not for wood doors, unless specifically requested. Expect a costly up-charge when requesting factory drilling and tapping. Similar to a standard hinge, when using a heavyweight floor closer, thicker gauge metal for the pivot arms mean that the materials will be thicker and the door and frame preparations will need to be coordinated.

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SLIDING AND FOLDING DOOR HARDWARE

Also Known As: Track and Hardware

DESCRIPTION

Track and hardware is used to hang folding and sliding doors, which are sometimes used for aesthetic purposes, but typically are installed to maximize the space around the opening by not having a swinging door that requires clearance all around so that the door swings freely.

Typical folding and sliding doors are not fire rated, although there are a handful of manufacturers that do manufacture a fire rated heavy duty fire rated sliding door for building separation applications.

When specifying track and hardware, you must also consider any type of pulls, locking devices, or stops that may be required as they are typically not included in the standard track and hardware set.

PROPERTIES

Sliding door track and hanger components are manufactured with different weights, thicknesses, and materials in order to accommodate the various door sizes, materials, and weights.

Bearings

NEEDLE BEARINGS

Some manufacturers incorporate needle bearings into the hangers in order to help with the lateral or side-to-side movement of the hangers with the sliding operation of the door.

Finishes

Tracks have traditionally not been a consideration for aesthetic reasons and were concealed as often as possible. In recent years, sliding doors have become more popular with unique track and hanger designs being developed to add aesthetic appeal to the opening. Finishes include polished steel or stainless steel, polished and satin brass or bronze, and anodized aluminum.

Materials

Tracks are typically available in anodized aluminum, brass, bronze, stainless steel, and steel, depending on the manufacturer and availability.

Tracks

Tracks are available in different configurations, which in turn work with specific hangers, which are the mechanisms with rollers that attach the door with brackets and allow the door to slide across the track.

BOX SHAPE

This track is square where the top attaches to the top jamb of the framed opening or the face of a wall and the wheels suspend the door and slide along the inside of the box. There is an opening at the bottom where the hanger sticks through and attaches to the door. The track can be straight for a single sliding door or a pair of bi-parting doors, can be manufactured curved for a curved wall and opening, or can be installed parallel in multiples to accommodate a bi-passing application. The track also has the option to come manufactured with a fascia, also known as flashing, to cover the track, rollers, and hangers behind it.

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GROOVE

This track sits on the floor and rather than suspend the door from the track, the weight of the door is borne on the track and floor. This type of track typically has grooves that accept sheaves, which are metal wheels that glide along the grooves on the track.

TEE SHAPE

This track is shaped like a tee where the rollers grab the vertical portion of the tee on both sides and suspend the door while the horizontal portion of the tee attaches to the top jamb of the framed opening.

ROUND SHAPE

Round tracks typically attach to the top jamb of the framed opening or the face of a wall and the wheels suspend the door and can slide along the inside of the tube. There is an opening at the bottom where the hanger sticks through and attaches to the door. The track can be straight for a single sliding door or a pair of bi-parting doors or can be installed parallel in multiples to accommodate a bi-passing application.

There are tracks that are tubular in shape where the track is installed on the face of the wall and door opening. The hangers rest on top of the tube track and the hangers have their own unique aesthetic with the rollers on top instead of rolling along the inside.

Weights

LIGHT

Lightweight track and hangers are available to carry light door weights up to 25 to 75 pounds and are not recommended for frequently used openings.

MEDIUM/STANDARD

Medium-weight track and hangers are available to carry light door weights up to 150 to 200 pounds and are recommended for medium frequency of use.

HEAVY

Heavyweight track and hangers are available to carry light door weights up to 1,000 pounds and are ideal for frequently used openings but can be expensive.

TYPES

Folding

Folding doors are fixed at one end with a top and bottom pivot and slide at the other. The doors fold together as you open them and extend next to each other when closed. This application helps save space where a swinging door might not have the room to swing all the way open or around due to a narrow corridor or other situation.

Folding doors require additional accessories such as hinges to attach the leaves of the folding doors together and can be installed in various configurations such as with two doors to create a single-fold door, four doors to create a double-fold door, two single-fold doors to create a pair of folding doors, to name a few combinations.

Sliding

Sliding doors can be installed as single doors or pairs of doors with many configurations available. They can be surface-mounted on a wall, bi-passing doors within one opening, single or double in a pocket, and even on the floor with rollers that are called sheaves, which roll along a grooved track on the floor.

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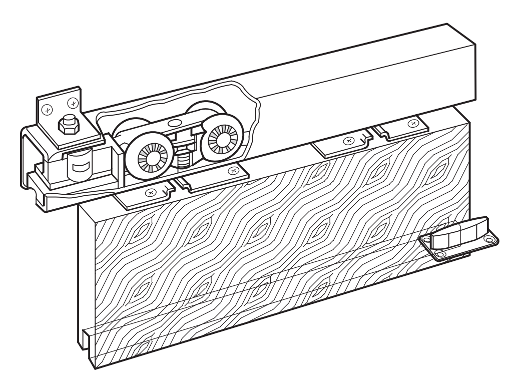


FIGURE 1.109 Sliding Door Hardware
(Source: Courtesy of Pemko Manufacturing Company)

OPTIONS

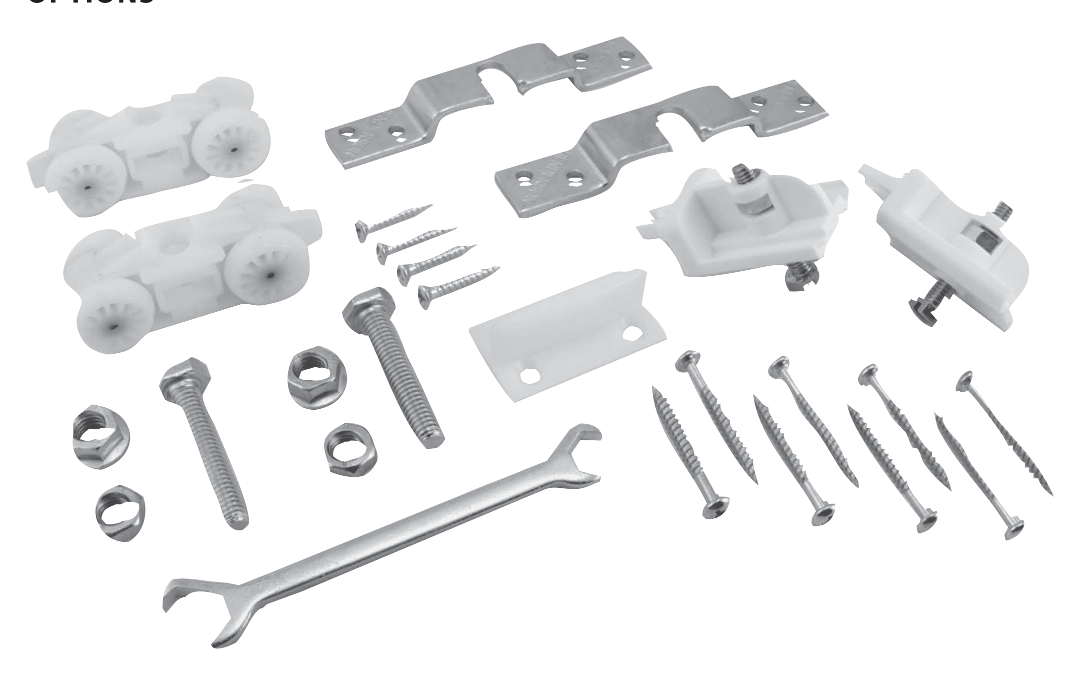


FIGURE 1.110 Sliding Door Hardware
(Source: Courtesy of Pemko Manufacturing Company)

Side Wall Track

This option is available where the track is mounted on a wall where the ceiling or head of the jamb is not perpendicular but rather at a 45-degree angle. The angle of the top of the track where it mounts is also at 45 degrees, allowing for proper fastening.

Fascia

A fascia is a decorative cover, which is installed over or manufactured as part of the sliding door track. The fascia covers the track and hangers so that they are not visible and only the surface of the covering or fascia is seen. The fascia can be painted or coated with an architectural finish or another type of finish material.

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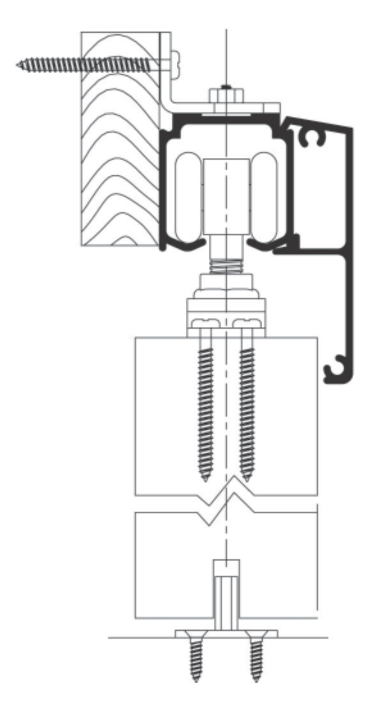


FIGURE 1.111 Sliding Wall Track
(Source: Courtesy of Pemko Manufacturing Company)

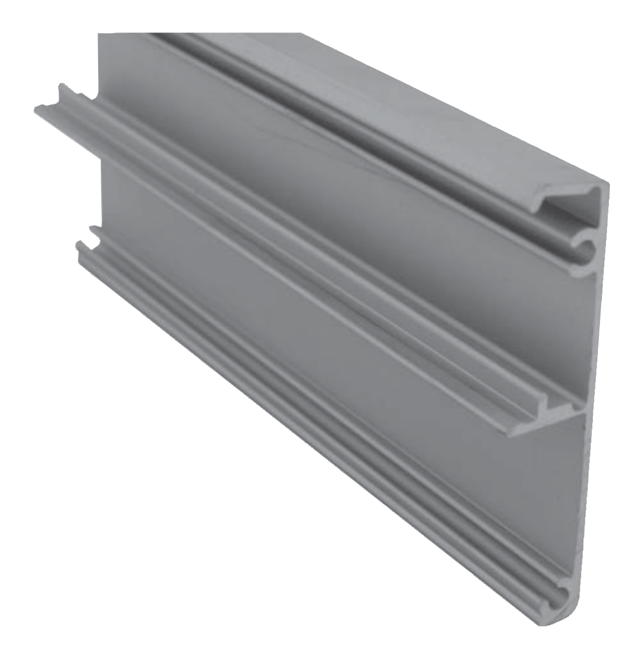


FIGURE 1.112 Track Fascia
(Source: Courtesy of Pemko Manufacturing Company)



FIGURE 1.113 Track Fascia
(Source: Courtesy of Pemko Manufacturing Company)



FIGURE 1.114 Channel Guide
(Source: Courtesy of Pemko Manufacturing Company)

Guides

Floor guides are available to help guide the doors for optimal use and to help avoid any damage to the surrounding conditions.

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CHANNEL

The channel is installed along the entire length of the bottom of a folding or sliding door opening and either surface-mounted or recessed in the floor. If surface-mounted, it is more likely in an opening that is not frequently passed through, such as a closet.

CHANNEL ROLLER

The channel roller is typically a fixed pin or caster to the bottom of the door that fits and rolls along the channel guide. This keeps the door straight in the opening and helps prevent the doors from knocking into a wall or each other if against a wall, in a pocket, or bi-passing.

FLOOR

Floor guides are available in different shapes and sizes to accommodate the different types of doors and thicknesses available.

SIDEWALL

A sidewall channel is used when the door is mounted on the face of the wall and helps keep the door from scraping against and along the wall as it slides across the door opening.

THRESHOLD

A threshold guide is similar to a typical threshold (see Accessories, Types, Thresholds in Chapter 7), except the threshold has a groove for a channel roller guide.

Hangers

Hangers are used to hang the door from the track, which typically incorporate rollers, which help the door slide easily across the track. Hangers are available in different sizes and duties, depending on the door size, weight, and frequency of use.

Mounting Brackets

Various mounting brackets are available to accommodate any special installation conditions that might exist or arise during construction. Check with various manufacturers or your local door opening consultant.

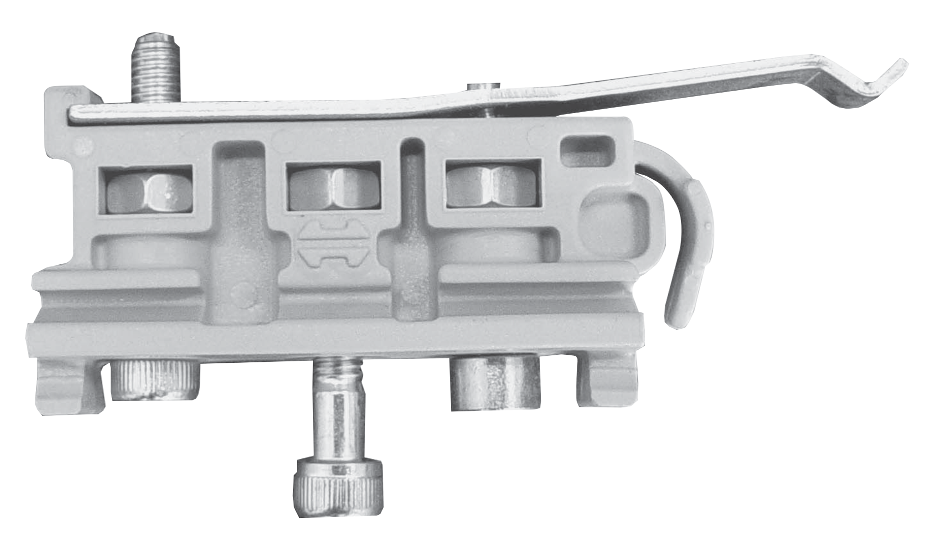


FIGURE 1.115 Hangers
(Source: Courtesy of Pemko Manufacturing Company)

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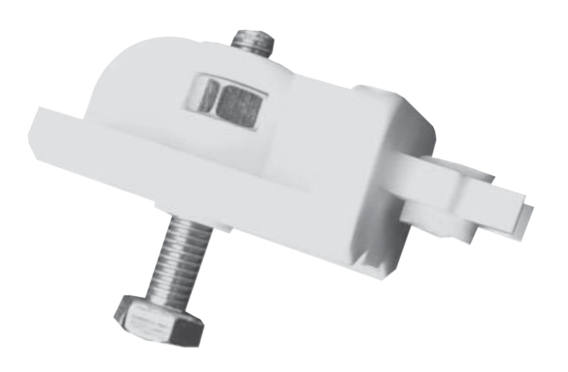


FIGURE 1.116 Hangers
(Source: Courtesy of Pemko Manufacturing Company)



FIGURE 1.117 Track Stop
(Source: Courtesy of Pemko Manufacturing Company)

Stops

Stops are used to stop a door from sliding past the end of the track and possibly into a wall or frame or framed opening side jamb. They can also be installed in a pocket to stop the door in the pocket before hitting the wall.

FLOOR

Floor stops are attached to the floor and can be used to stop the door in the open or closed position.

TRACK

Track stops are attached to the track by screws or a clip, and they create stops for doors to hit up against. The stops can either be a hard stop or have a bumper at the end for a softer stop.

WALL

Wall stops or bumpers are attached to the wall or frame or opening side jamb and can be used to stop the door in the open or closed position.

QUANTITIES

Tracks and hangers are typically furnished in sets for each door opening. Each track that holds a door typically has a set or pair of hangers and rollers. Optional items like stops, pulls, locking devices, and special application hardware need to be specified separately.



FIGURE 1.118 Wall Stop
(Source: Courtesy of Pemko Manufacturing Company)

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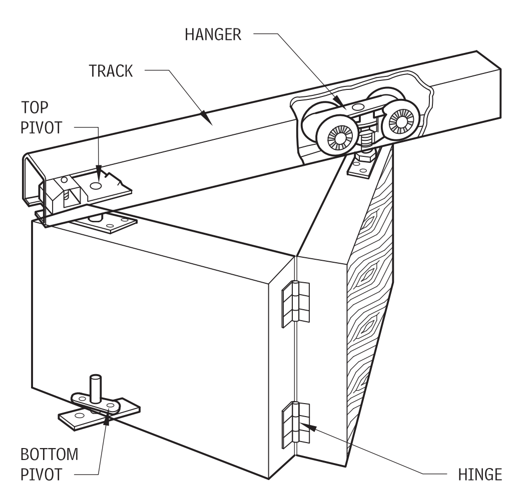


FIGURE 1.119 Bi-Folding Door Hardware
(Source: Courtesy of Pemko Manufacturing Company)

APPLICATIONS

Bi-Folding

Bi-folding doors are two-panel doors that are fixed at one end with a top and bottom pivot and slide at the other. The doors fold together as you open them and extend next to each other when closed. This application helps save space where a swinging door might not have the room to swing all the way open or around due to a narrow corridor or other situation.

Bi-folding doors require hinges to attach the leaves of the folding doors together and can be installed in various configurations such as with two doors to create a single-fold door.



FIGURE 1.120 Face Mounted Sliding Door
(Source: Courtesy of Rockwood® Manufacturing Company)

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FIGURE 1.121 Sliding Door Edge Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

Bi-Parting

Like a pair of doors that part from each other and separate to open the door, bi-parting doors can be surface-mounted on the wall or installed in pockets in the walls. Suspended or floor-mounted tracks can be used for this application. Typically, the same track that is used for a single sliding door track can be used; the doors are butted up against each other and part from one another as they open.

Bi-Passing

Bi-passing doors are installed with two doors next to each other on separate tracks, either aligned or on one double track. This allows the doors to pass each other, saving space since there is no need for space to swing doors open. Bi-passing doors are typically opened one at a time, hiding behind one another, which blocks one side of the door opening. Suspended or floor-mounted tracks can be used for this application.

Face-Mounted

Also known as barn door hardware, sliding doors can be installed where the track is surface-mounted to the face of a wall and the door hangs and slides on the front of an opening. When surface-mounted, and depending on aesthetic preference, the track is either exposed or a decorative fascia is installed to hide the track.

Pocket

Pocket sliding doors conceal half of the track in a pocket in a wall, hiding the door in the wall when in the open position. This type of door is the most space-saving type if the wall already exists,

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as the door utilizes the existing opening. A suspended track or floor track can be used for this application.

POCKET FRAME KITS

Some manufacturers offer pocket frame kits, which include all of the necessary parts required to install a pocket door; some include framing for door openings that are not already framed.



FIGURE 1.122 Sliding Door Flush Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

Patch Fittings

Patch-fitting hangers are available for glass doors that do not have top or bottom rails to accept standard track hangers. The fittings are attached to both sides of the glass, sandwiching it in between.



FIGURE 1.123 Sliding Door Flush Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

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FIGURE 1.124 Sliding Door Flush Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

Coordinating the glass thickness with the patch fitting is necessary to ensure the glass will fit into the patch fittings properly.

Single

Single sliding doors can be installed on a wall and over the door opening, in a pocket, or a folding door.





FIGURE 1.125 Sliding Door Locking Device
(Source: Courtesy of Rockwood® Manufacturing Company)

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Floor-Mounted

Aldo known as sheaves and track, this application sits on the floor and rather than suspend the door from the track, the weight of the door is borne on the track and floor. This type of track typically has grooves that accept sheaves, which are metal wheels that glide along the grooves on the track.

Soffit-Mounted

Soffit-mounted tracks, or tracks installed on the top jamb of a frame or door opening, are a typical track installation. The fasteners go up through the track and secure the track to the head, which holds the weight of the folding or sliding door.

INSTALLATION

Sliding door hardware can be installed on the face of the wall over the opening with brackets to suspend the track, underneath the frame head or framed opening on the soffit, or on the floor with sheaves and track rather than hangers and track.

Fasteners

Track and hangers are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Each manufacturer typically recommends installation requirements and locations for fasteners and devices in order for track and hangers or sheaves to operate properly.

Preparations

Doors, frames or framed openings, and floors are typically not prepared for track and hangers prior to installation, as they are surface-mounted for the most part. Sheaves for floor track might be prepared, as they are recessed in the bottom of the door; it is best to coordinate and confirm with your door manufacturer.

Preparations that will likely take place at the door and frame factories along with manufacturing are recessed pulls and locking and strike devices. Whether recessed at the edge or on the face of the door, these pulls and devices require preparation prior to installation.

REFERENCES

Codes and standards are available to set the minimum requirements of door openings (see Introduction of this book for more information). Some jurisdictions have specific codes and standards, which were either modified from another existing code or created for their own use.

Language and section numbers can change slightly or drastically when the codes are updated. Look for an outline, if available, of the changes that took place in the respective update.

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CODES

International Building Code (IBC)

Following are chapters of a modified or fully adopted version of the International Building Code that refer to hanging means door hardware in general:

- Chapter 7: Fire and Smoke Protection Features
- Chapter 10: Means of Egress
  - Section 1008: Doors, Gates and Turnstiles
- Chapter 17: Special Inspections and Tests
- Chapter 26: Plastic
  - Section 2603: Foam Plastic Insulation

National Fire Protection Association (NFPA) 101: Life Safety Code

Following is a chapter of a modified or fully adopted version of the NFPA 101: Life Safety Code, which refers to hanging, means door hardware in general:

- Chapter 7: Means of Egress

STANDARDS

ADA Standards for Accessible Design (ADAAG)

The following is a chapter of a modified or fully adopted version of the ADA Accessibility Guidelines for Buildings and Facilities, that refers to hanging means door hardware in general:

- Chapter 4: Accessible Routes

ASTM International (ASTM)

There are hundreds of ASTM International testing standards that are related to doors and door hardware, from material and assembly testing to installation and application testing.

Door and Hardware Institute (DHI)

Following are technical documents available for reference that refer to hanging means door hardware in general:

- Abbreviations and Symbols
- Basic Architectural Hardware
- Hardware for Healthcare Facilities
- Installation Guide for Doors and Hardware
- Processing Hardware for Custom Aluminum Entrances
- Recommended Locations for Builders' Hardware Custom Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Flush Wood Doors
- Recommended Procedures for Processing Hardware Schedules and Templates
- Sequence and Format for the Hardware Schedule
- Tech-Talk ASD-1 Aluminum Storefront Doors
- Tech Talk BH-1 Butts and Hinges
- Tech-Talk CH-1 Continuous Hinges
- Tech-Talk EAH-91 Electrified Architectural Hardware

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- Tech-Talk FC-1 Concealed Floor Closers
- Tech-Talk P-1 Pivots
- Tech-Talk SP-1 Hardware Specification Writing

International Code Council (ICC) A117.1 Accessible and Usable Buildings and Facilities

International Code Council A117.1 Accessible and Usable Buildings and Facilities, (ICC)

The following is a chapter of a modified or fully adopted version of the ICC A117.1 Accessible and Usable Buildings and Facilities that refers to hanging means door hardware in general:

- Chapter 4: Accessible Routes

National Fire Protection Association (NFPA)

The following are chapters of a modified or fully adopted version of NFPA 80: Standard for Fire Doors and Other Opening Protectives, that refer to hanging means door hardware in general:

- Chapter 5: Care and Maintenance
- Chapter 6: Swinging Doors with Builders Hardware
- Chapter 7: Swinging Doors with Fire Door Hardware
- Chapter 8: Horizontally Sliding Doors
- Chapter 9: Special-Purpose Horizontally Sliding Accordion or Folding Doors
- Chapter 16: Access Doors
- Chapter 19: Installation, Testing, and Maintenance of Fire Dampers
- Annex A: Explanatory Material

The following is a chapter of a modified or fully adopted version of NFPA 105: Standard for Smoke Door Assemblies and Other Opening Protectives that refers to hanging means door hardware in general:

- Chapter 6: Installation, Testing, and Maintenance of Smoke Dampers

The following is a chapter of a modified or fully adopted version of NFPA 252: Standard Method of Fire Tests of Door Assemblies that refers to hanging means door hardware in general:

- Chapter 5: Fire Door Assembly
- Annex B: Commentary

American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA)

The following are standards that refer to hanging means door hardware in general:

- ANSI/BHMA A156.1 American National Standard for Butts and Hinges
- ANSI/BHMA A156.7 American National Standard for Template Hinge Dimensions
- ANSI/BHMA A156.14 American National Standard for Sliding and Folding Door Hardware
- ANSI/BHMA A156.17 American National Standard for Self Closing Hinges & Pivots
- ANSI/BHMA A156.18 American National Standard for Materials and Finishes
- ANSI/BHMA A156.20 American National Standard for Strap and Tee Hinges and Hasps
- ANSI/BHMA A156.26 American National Standard for Continuous Hinges

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- ANSI/BHMA A156.32 American National Standard for Integrated Door Openings Assemblies
- ANSI/BHMA A156.115 American National Standard for Hardware Preparation in Steel Doors and Steel Frames
- ANSI/BHMA A156.115W American National Standard for Hardware Preparation in Wood Doors with Wood or Steel Frames

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SECURING DEVICES

Now that the door is hanging, the next part of the sequence is to secure the door.

When specifying any type of electrified hardware, operations descriptions, also known as operations narratives, should always be used. These descriptions are short paragraphs that describe the operation of every part of the opening from either side, so that the designer, installer, and user can all have the same understanding of what is supposed to happen at the opening at any given time. Also required should be elevation and point-to-point diagrams. Elevations provide an overview of what the opening looks like with all of the components of the system connected. The point-to-point shows the system connections as well, but is geared more toward the actual wiring, including the colors and connections of each. A logic diagram might be used by the person who designed the system in order to lay out the "logic" of the system flow and process.

Some electrified devices are now being manufactured with solar power; that is, they get their power either fully or partially from the sun in order to operate. This might be beneficial for a very remote site that might require some type of electrified locking device, where it is not feasible to monitor or change the batteries.

INACTIVE LEAF OF PAIRS OF DOORS

When specifying or scheduling a pair of doors, the inactive leaf is always secured first. Logistically, if the inactive leaf of a pair of doors is not secured first, then the active leaf has nothing to secure itself into, leaving both of them unsecure and vulnerable. In other words, the inactive leaf must act as the fixed material that the frame or wall would be for a single door opening.

Once we have secured the inactive leaf of a pair, or if we are specifying a single door opening only, the proper securing device is then specified. There are many factors, options, and preferences to take into account when securing the opening, including function, code, aesthetics, sustainability, and personal preference.

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BOLTS

Also Known As: Flushbolts, Surface Bolts, Slide Bolts

DESCRIPTION

Bolts are used primarily to secure the inactive leaf of a pair of doors so that the active leaf has the ability to be secured into the inactive leaf. This can be accomplished using several applications, depending on the function of the door opening and its related codes.

Manual flushbolts are typically the most common means to secure an inactive leaf of a pair of nonfire rated doors, and they are also known as lever extension flushbolts. Automatic flushbolts are typically used to secure fire rated doors, and self-latching flushbolts are another available type.

Although bolts are most commonly used, exit hardware might be used instead to secure the inactive leaf, typically when both leaves of the pair of doors are active or when life safety codes require both doors of the pair for egress. Other ways to secure an inactive door are surface-mounted manual slide bolts and Cremone bolts, which are decorative surface bolts typically operated by a knob or lever.

PROPERTIES

Bolts are typically manufactured as a piece of solid metal like a pin or rod, which extends out or off of a door and into a frame, wall, or door and into a strike plate. The extension or throw of the bolt can be done manually or automatically, and it can be mounted on the surface or face of the door or frame, or recessed and flush within the door. Flushbolts are typically pins or rods housed in a metal casing for installation into a recessed pocket in the edge of the door.

Corners

RADIUS

Radius corner bolts and or housings are rounded at the edges instead of having square corners and do not affect the operation of the device, only the aesthetics. Radius corners are most typically used on residential applications, although they are available and able to be used in commercial operations.

SQUARE CORNER

Square corner bolts and or housings are square-edged and are most typically used in the commercial industry, although they are available and able to be used in residential applications as well.

Finishes

Depending on the manufacturer's availability, bolts are typically available in most architectural finishes. They are not usually available in a prime finish, which is typically used for painted applications that would match the door and or frame; plated finishes are most commonly used. Sometimes finished products are painted the same color and at the same time as the door, frame, and surrounding areas. Painting the device is not recommended as it might cause the paint to dry in places where there are moving parts, prohibiting the device from operating properly or at all.

Painting bolts or anything onsite is not recommended as it will contribute to poor air quality for those working on and eventually working in the space. Using a manufacturer's factory finish might even help contribute to credits toward a current or future green building standard, code, or certification.

Grades

With strict guidelines for testing, bolts are rated in grades 1, 2, and 3 for various types of tests including impact, friction, and cycle tests.

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IMPACT

Impact tests rate the impact of force against the opening in the same direction of the door swing. The impact is typically off center on the door where the bolts are installed.

FRICTION

Friction tests measure the retraction of the bolt with a weight load to the bolt against the strike in the direction of the door swing. Typically, the weight load will make it more difficult and, if very heavy, will prevent the bolt from retracting at all.

CYCLE

Cycle tests measure the full extension and retraction of the bolt into and out of the strike. In other words, the bolts are engaged and disengaged over and over again until they meet ANSI/BHMA minimum requirements or fail to work properly.

Materials

Bolts are manufactured from various materials, including aluminum, brass, bronze, stainless steel, or steel. The material type specified and installed can depend on the door opening application and fire rating requirements.

If a door opening is fire rated, the material tested and approved is likely steel, since it can withstand the high temperatures of a fire for a certain period of time. If anything other than a steel base is installed on a fire rated door opening and a fire occurs, the metal might melt enough to cause the opening to fail, allowing the fire to spread from one side of the opening to the other prematurely of the actual fire rating of the door.

Automatic bolts and flushbolts are manufactured specifically to the door material, whether wood or metal. Typically, bolts for metal doors are mortised into a cutout in the edge of the door several inches down from the top corner of the door. Because wood doors are typically weaker when mortised for door hardware, bolts for wood doors are typically mortised into the edge of the door at the top corner and wrap around the top of the door for a more secure installation.

Ratings

NONFIRE RATED

Nonfire rated bolts can only be used on doors that are not fire rated openings and would typically be of the manual type, as they are not able to latch automatically at the time of a fire.

FIRE RATED

Fire rated bolts should only be applied to fire rated doors, although they can be used on nonfire rated as well for function. Fire rated bolts are typically of the automatic type, so they can latch automatically at the time of a fire to protect the nonfire side of the opening from the fire side.

Sizes

Bolts are available in different lengths, depending on the door height and reach necessary to operate the bolt.

AUTOMATIC FLUSHBOLTS

Typically a small bolt at the very top and bottom edges of the door, these devices operate automatically and do not need to be reached or accessed to operate. Therefore, the top is typically out of reach without help from a stool or ladder.

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MANUAL FLUSHBOLTS

Typically furnished with 12-inch rods, the device can be reached and operated by reaching your arm up or down and flipping the lever. With taller than normal doors, or doors over 7-feet high, options exist for longer rods, which means the device can be installed lower on the edge of the door so that it can still be reached and operated manually.

SURFACE BOLTS

Surface bolts are available in many standard and custom lengths from several inches to several feet in length.

TYPES

Automatic

Automatic flushbolts are actuated by triggers at the edge of the door. When the active door closes into the inactive door, the triggers are depressed into the bolt mechanism and the bolts are projected into the head of the frame and the floor automatically. When the active door is pulled or pushed into the



FIGURE 2.1 Automatic Metal Door Flushbolts
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 2.2 Automatic Wood Door Flushbolts
(Source: Courtesy of Rockwood® Manufacturing Company)

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open position, the same triggers are released, which in turn retracts the bolts automatically. Once the bolts are retracted, the inactive door is released and can be swung into the open position.

Automatic flushbolts are not only used on pairs of doors when the doors need to be accessible for convenience or to move wide equipment or furniture through the opening, but also they would be one of very few options to secure a pair of fire rated doors. Fire rated doors must latch and secure on their own when a fire condition occurs, so manual or self-latching doors would not be an option, as they must be set up manually by someone to lock the door, whereas automatic doors will always do the job without any help. There are some exceptions to having to use automatic flushbolts on pairs of fire rated doors. For example, in rooms that are typically not inhabited by humans, such as a mechanical room housing a transformer or a storage room, manual bolts, either surface- or flush mounted, can be used where acceptable to the AHJ on the inactive leaf of a pair of doors.

Cremone

A cremone bolt is a surface-mounted top and bottom bolt that is most typically used in residential applications and for its aesthetic properties. The top and bottom bolts are operated by a knob or lever that when rotated, retracts or extends the bolts into the head of a frame or door opening and floor, allowing the door to be unlocked or locked. As with the surface bolt, cremone bolts are ideal for retrofitting applications due to the lack of door preparation required to install the device, and they are also typically installed on narrow stile doors, where a minimal amount of space is available for a locking device.

Dutch Door

Dutch door bolts are typically used for one type of door, you guessed it, a Dutch door, which is a single door with top and bottom leaves. A Dutch door bolt is used to secure the top leaf into the bottom leaf,

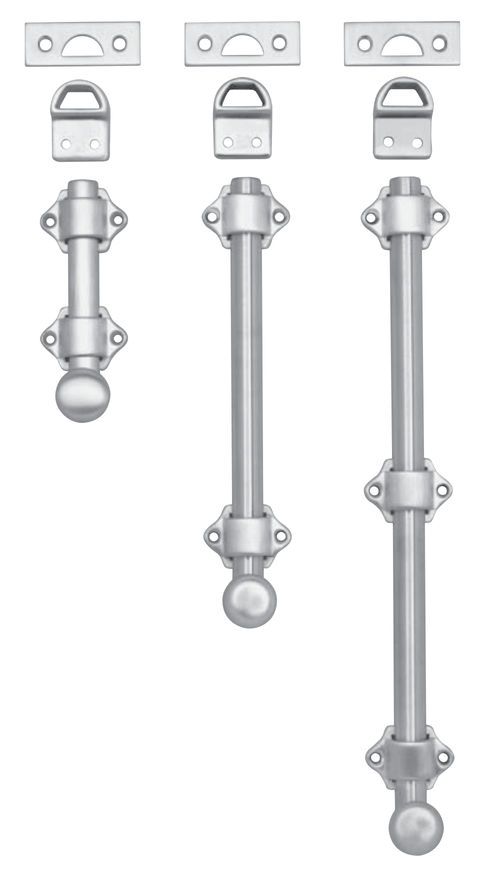


FIGURE 2.3 Dutch Door Bolts
(Source: Courtesy of Rockwood® Manufacturing Company)

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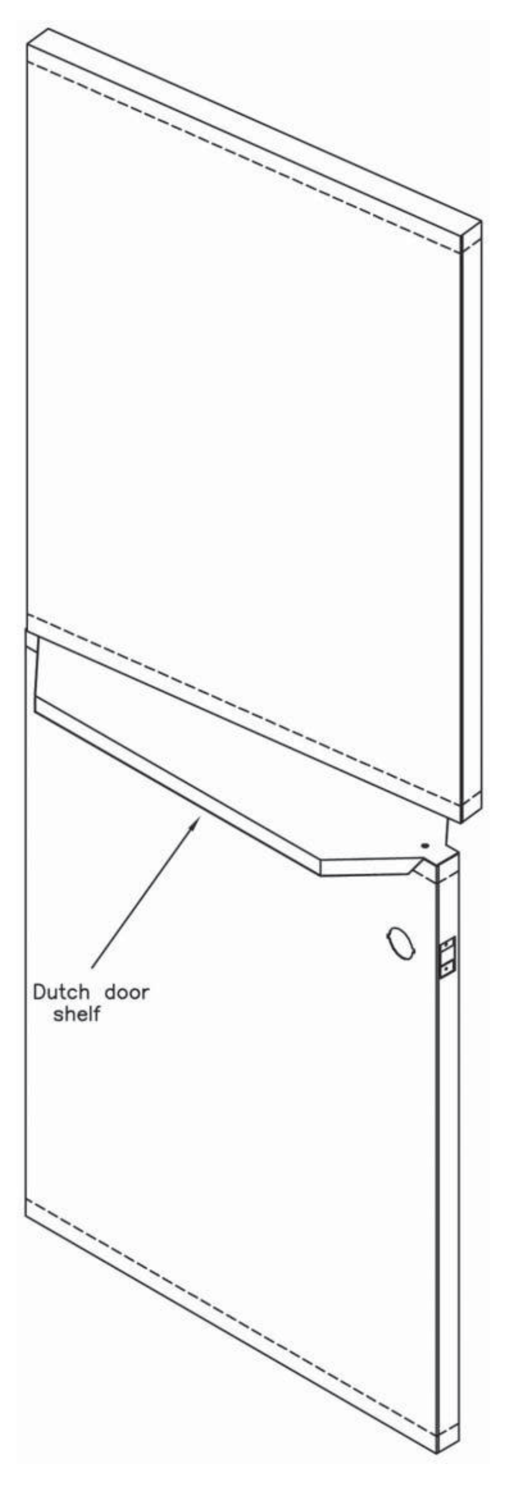


FIGURE 2.4 Dutch Door Diagram
(Source: Courtesy of Ceco Door)

most commonly used where a low need of security or traffic control is required. This application allows the ability to pass things through the top leaf when it is in the open position while the bottom leaf is closed; for example, in a coat check room, library storage, or any other type of room that is not public.

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A Dutch door would indicate that only those authorized should pass through, while allowing coats, books, or anything else that the doorway might be used for to be passed through it without opening the door fully and allowing unauthorized people to pass through.

Fire

A fire bolt is a heat-sensitive device that projects out of the bottom edge of a door and into the second door in the pair when the core of the door reaches a certain temperature, typically 230 degrees Fahrenheit. Although automatic in a sense, this bolt is not allowed on fire rated doors unless used with a tested and listed automatic top bolt or top rod fire exit hardware. This bolt does not require the use of a dust-proof strike.

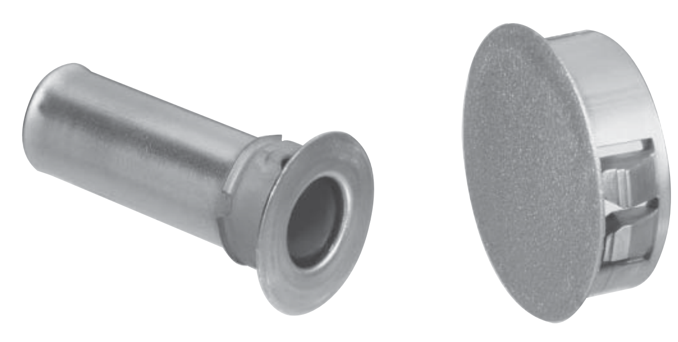


FIGURE 2.5 Fire Bolt for Metal Doors
(Source: Courtesy of Rockwood® Manufacturing Company)

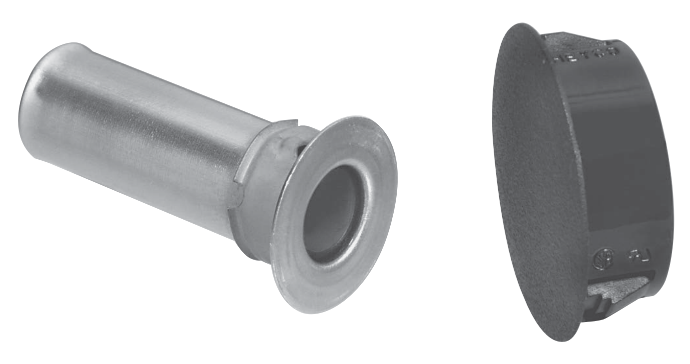


FIGURE 2.6 Fire Bolt for Wood Doors
(Source: Courtesy of Rockwood® Manufacturing Company)

Manual

Manual bolts are actuated just as their name says, manually, and the bolt of a flushbolt is thrown or retraced with a flip lever. The flip lever is typically recessed in the edge of the bolt mechanism and is flush with the device when the bolt is fully thrown or retracted. This would not only be aesthetically beneficial but is required for operation so that the door can swing into the frame without any obstructions.

A surface bolt, also known as a slide bolt, is manually slid across a surface, typically a door into a strike on the frame. Surface bolts are available in many sizes and thicknesses, depending on the door size and security level of the opening you are trying to secure. For higher security, some surface bolts are available with a cylinder that requires a key to release the bolt in order to slide it.

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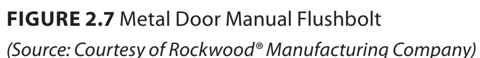


FIGURE 2.7 Metal Door Manual Flushbolt
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 2.8 Wood Door Manual Flushbolt
(Source: Courtesy of Rockwood® Manufacturing Company)

Self-Latching

The least specified and installed type of flushbolt, self-latching bolts are a combination of manual and automatic, where the triggers and bolts can be set to latch manually or automatically, depending on the required function and operation of the door opening.

OPTIONS

Dust-Proof Strike

When bolts are specified and installed on inactive leaves of pairs of doors, a typical surface or recessed rectangular strike is furnished with the device to accept the bolt when engaged in order to secure the door. Another option to the standard strikes supplied is the dust-proof strike, which is typically mounted on the floor (but could be used in the head). The dust-proof strike has a spring and cover, which is depressed when the bolt is projected and springs back flush to the surface to cover the hole when the bolt is retracted.

The main function of the strike is to protect the opening that accepts the bolt from dirt buildup, typically more so on the floor, so the bolt can project fully every time it is engaged. If a standard strike is

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FIGURE 2.9 Metal Door Self-Latching Flushbolt
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 2.10 Wood Door Self-Latching Flushbolt
(Source: Courtesy of Rockwood® Manufacturing Company)

used, every time someone walked over it, cleaned the area with a mop or broom, or just everyday dust accumulation, the buildup would eventually prevent the bolt from engaging fully, as the dirt would be filling the void instead.

Extended Rod

Extended rods are available for manual flushbolts for doors that are taller than 7 feet. This means the flip lever that operates the device can be low enough at the edge of the door while having a long enough rod to extend to the frame head or opening in order to secure the opening properly.

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FIGURE 2.11 Dust-Proof Strike
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 2.12 Flushbolt Rabbet Kit
(Source: Courtesy of Rockwood® Manufacturing Company)

Nonkeyed

Most slide bolts are manufactured without a key and just slide across the door into the strike, which is typically applied to the frame or door if it is one of a pair.

Keyed

Some manufacturers offer slide bolts with a key so that the bolt cannot be extended or retracted without the use of the key. Again, most commonly, we might see this on the exterior of a home on a storage door or a barn-type door, or in a warehouse where recessing a conventional locking device is not feasible.

Rabbet Kits

For doors that are manufactured with a rabbet at the edge, accessories such as a rabbetted face plate and strike guide are available to accommodate this configuration.

QUANTITIES

Depending on their application, function, and governing codes, bolts can be furnished as single pieces or in a pair.

SINGLE

Typically, a surface-mounted bolt would be furnished as a single device and used in the middle of a door opening to secure it to a wall or another door.

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Flushbolts could be used as single pieces, either at the top of the door or bottom, as long as they are in compliance with codes and standards for application, function, and fire rating. An example of a single-use manual flushbolt is a moving partition that needs to be secured at the bottom only from the secure side of the door.

PAIR

Most bolts are furnished in top and bottom in pairs in order to secure the door opening to the frame or framed opening and floor.

APPLICATIONS

Flush

Flushbolts are typically installed in pairs, one at the top edge of the door and one at the bottom edge. This helps to maximize securing the door to its surrounding elements, typically the door frame and floor or saddle on the floor.

Flushbolts are manufactured to be installed in a specific door material, whether it is wood, aluminum, or other metal. In order to maximize securing, a strike would be installed on the head and floor for the bolt to engage into when in the locked or "thrown" position.

Surface

A surface bolt, sometimes referred to as a slide bolt, cannot be used on fire rated doors because it is a manually operated device.

Typically used on existing openings in a retrofitting application, surface bolts can be used on the inside of a door to secure it from the inside only or possibly on the outside of a door to simply keep the door in the closed position. The strike is applied to the frame, other door in a pair, or floor, and the bolt slides across the face of the door, frame, or wall, and into the strike to secure the opening.

Surface bolts are not commonly specified locking devices commercially, but are more prevalent in a residential application. However, you will see them used in warehouses and heavy door openings that must stay in the closed position but not be locked. These bolts have guides that help the device slide along the face of a door or opening properly and in line to meet the strike at the other end.



FIGURE 2.13 Surface-Mounted Slide Bolt Strike
(Source: Courtesy of Rockwood® Manufacturing Company)

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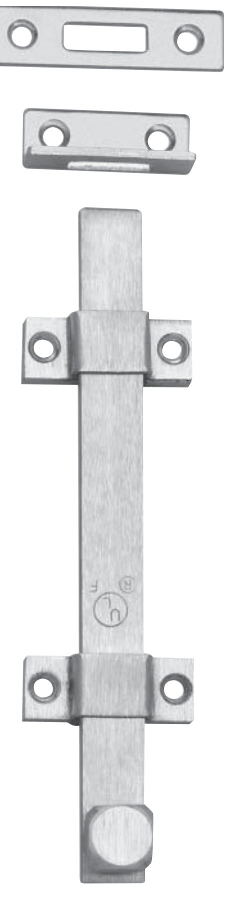


FIGURE 2.14 Surface-Mounted Slide Bolt
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 2.15 Surface-Mounted Slide Bolt
(Source: Courtesy of Scott J. Tobias)



FIGURE 2.16 Surface-Mounted Slide Bolt
(Source: Courtesy of Scott J. Tobias)

INSTALLATION

Bolts are typically installed in pairs as a top and bottom set, although they can be installed as a single. Flushbolts are usually installed at the top and bottom edge of the strike or latch side thickness of a door; this provides a consistent and equal-locking position, and rigidity of the door at both the top and bottom of the opening. Slide or surface bolts can be used for various functions, to secure the inactive leaf of a pair of nonfire rated doors, where the bolts would be installed at the top and bottom edge of the door strike or latch side thickness of a door. In both situations, the bolts latch or slide into the head of the frame or jamb and the floor or threshold if installed. If a slide bolt is used on a single door, it might be installed at the center on the latch edge of the door and secure itself into the frame or adjacent wall.

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FIGURE 2.17 Light Duty Surface Bolt
(Source: Courtesy of Scott J. Tobias)



FIGURE 2.18 Decorative Surface Bolt
(Source: Courtesy of Scott J. Tobias)

When installing bolts that latch into the floor or threshold if installed, it is recommended to include a dust-proof strike for the bolt to extend or latch into (see Dust-Proof Strike in this chapter).

If a bolt is being installed on a stile and rail door, always confirm the lock stile dimension to ensure that the bolt will have enough room to be installed.

Fasteners

Bolts are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat-head screws are available depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Bolts are typically installed at the top and bottom edge of the strike or latch side thickness of a door and latch or slide into the head of the frame or jamb and the floor or threshold if installed. If a slide bolt is used on a single door, it might be installed at the center on the latch edge of the door and secure itself into the frame or adjacent wall.

Always refer to the manufacturer's recommendations, standards, and codes relevant to the bolt being installed.

Preparations

Flush, recessed, or mortised bolt preparations are typically machined and reinforced by the manufacturer at the factory. Surface-mounted bolts typically require less or no factory preparation and can be installed in the field.

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CYLINDERS FOR LOCKING DEVICES

Also Known As: Cylinders

DESCRIPTION

Cylinders are typically operated by keys, which are what operate 98 percent of locked or secured doors today, although as the cost goes down and newer technologies and types of electrified locking devices become available, that percentage will continually shrink.

Cylinders are manufactured as a housing and plug with pins and springs that move when a key is inserted. This must create a consistent shear line, which allows for the key to rotate the plug in the housing, turning the tail piece of the cam, in turn allowing the latch or deadbolt to be retracted or extended to open or secure the locking device and door.

The triangular shapes that appear as peaks and valleys at different distances across the key are known as the blade, and the part of the key that sticks out of the cylinder is the bow. The peaks and valleys match the different pin sizes inside the cylinder, and the springs are installed underneath the pins to give them tension when the key is inserted.

PROPERTIES

Mechanical cylinders are typically manufactured with a metal housing that has a plug, which is where the key is inserted, along with springs, pins, and a cam to operate.

Electronic cylinders are available from some manufacturers where, in addition to the mechanical components of a cylinder, there is an electronic component that needs to match the key as well, sending a signal between the key bow and the cylinder to ensure the key is intended to open that particular cylinder. Basically, this is a second level of security to verify that the mechanical key is not an unauthorized duplication.

Cam

With the rotation of the plug also comes the rotation of the cam on the back of the cylinder, which operates the locking device itself. The cam is a small piece of metal that has a particular shape to



FIGURE 2.19 Cylinder Cam
(Source: Courtesy of SARGENT® Manufacturing Company)

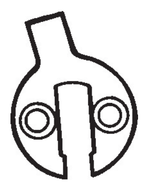


FIGURE 2.20 Cylinder Cam
(Source: Courtesy of SARGENT® Manufacturing Company)

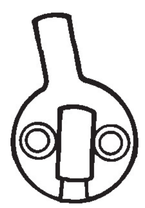


FIGURE 2.21 Cylinder Cam
(Source: Courtesy of SARGENT® Manufacturing Company)

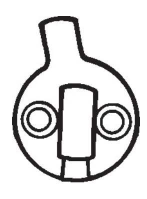


FIGURE 2.22 Cylinder Cam
(Source: Courtesy of SARGENT® Manufacturing Company)

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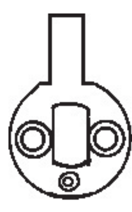


FIGURE 2.23 Cylinder Cam
(Source: Courtesy of SARGENT® Manufacturing Company)

operate the specific mechanisms inside of a lock body or chassis, in order to rotate and trigger the proper operation of the locking device.

Finishes

Depending on the manufacturer, cylinders are typically available in all architectural finishes to match the other specified hardware on the opening.

Painting cylinders or anything on site is not recommended as it will contribute to poor air quality for those working in the space. Using a manufacturer's factory finish might even help contribute to credits toward a current or future green building standard, code, or certification.

Collar

A cylinder collar surrounds the cylinder between the its face and the door or surface upon which it is installed. The collar provides the separation or acts as a spacer so that there is no void and the cylinder sits flush against the door. Without the collar, the cylinder might be exposed for tampering.



FIGURE 2.24 Cylinder Collar
(Source: Courtesy of SARGENT® Manufacturing Company)

Grades

Although cylinders are not typically referred to in grades, ANSI/BHMA A156.5 American National Standard for Cylinders and Input Devices for Locks, 2010, describes grades 1, 2, and 3. The grading tests include operational, finish, and security tests. These tests include torque to rotate cylinder plug, cylinder body or housing tension and torque tests, cycle testing, cylinder plug pulling tests, and cylinder plug torque tests.

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Housing

All of the components, including the cylinder plug, springs, and pins all come together in the housing where they work together in order to operate the cylinder.

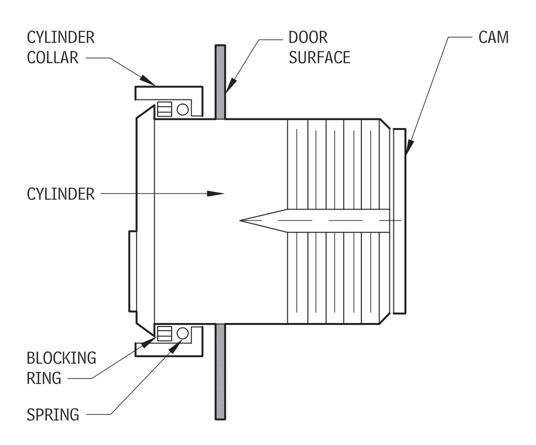


FIGURE 2.25 Cylinder Illustration
(Source: Courtesy of SARGENT® Manufacturing Company)

Keying

The subjects of keying and master keying should have their own manuscript and reference guide, more suitably written by a master locksmith, one of which I am not, but several of whom I have close friendships. With that said, I will give a brief overview of keying in general.

Not including the various levels of security that cylinders have as options, keying can be very simple or very complicated. Cylinders can be individually keyed, also known as keyed different, or KD, or a change key. They can also be master keyed at various levels.

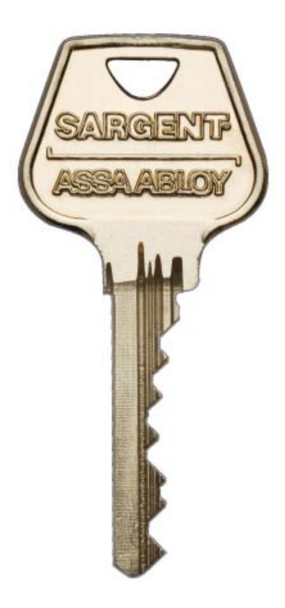


FIGURE 2.26 Mechanical Key
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.27 Mechanical Key
(Source: Courtesy of SARGENT® Manufacturing Company)

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Keying is done with mathematics. There are certain calculations, depending on the number of pins in a cylinder, whether it be 5 pins or 6 pins, with or without sidebars or various levels to create the matching shear line in order to rotate the plug in the housing to operate the locking device.

Master Keying

Master keying is the art of creating a master key system, pinning, and operation of a key and cylinder. A master key is a key that opens all or part of the locks in a system, but there can also be various levels of master keying. An example is a floor master key where the floor master only opens a respective floor, such as the third floor, while the grand master key opens all of the locksets on the first, second, and third floors. A great grand master key would open several buildings, say, in a global company or several buildings on one site like a campus. This way the CEO or any other executive requiring access to all or certain parts of a facility would only need to carry one key and it would operate no matter where he or she traveled.

Another type of master key is the janitor key, which would only open the janitor closets in a building, or an exterior master, where the key would only open all perimeter doors.

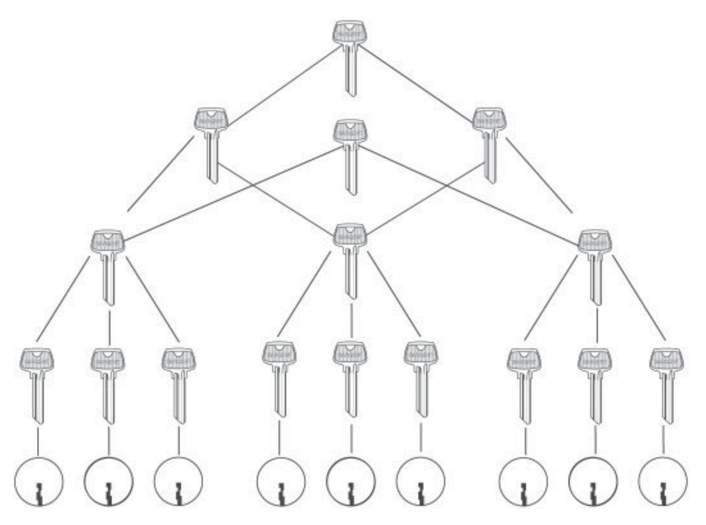


FIGURE 2.28 Simple Master Key System Illustration
(Source: Courtesy of Rockwood® Manufacturing Company)

Materials

Cylinders are typically manufactured from cast, forged, or wrought extruded aluminum, brass, or bronze. Some other options available are stainless steel, iron, wrought steel, and zinc alloys.

Pin

The pins and springs are aligned in length with the key cutouts so that the shear line or multiple shear lines in a multilevel master key system can be created. Some manufacturers offer higher security cylinders where there are additional alignments that need to take place in addition to the main shear line, such as side bar alignment.

Plug

A key has various depth cutouts along the top of the blade that protrudes out of the bow, which is what our fingers grab onto in order to rotate the key in the cylinder. These cutouts need to align with what is known as the shear line inside of the cylinder plug so that the plug will rotate in the cylinder housing.

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Side Bar

Some manufacturers offer higher-security cylinders, where there are additional alignments that need to take place in addition to the main shear line, such as side bar alignment. The cylinders are manufactured with bars along the sides that require the key to have grooves to accept those side bars; otherwise the key will not enter the cylinder plug at all.

Spring

The springs and pins are aligned in length with the key cutouts so that the shear line or multiple shear lines in a multilevel master key system can be created.

TYPES

Conventional

Conventional cylinders are available for all applications. The face of the cylinder, or housing, is round with a round center, or plug, where the key is inserted. As described above, the shear line must be created in order to rotate the key. A conventional cylinder can only be installed and replaced by taking apart the locking device, which can be time consuming and costly in labor.

Electronic

Electronic cylinders are the current and next-generation technology for locking and unlocking devices. Similar in design to mechanical cylinders, electronic cylinders require the use of power to verify the electronic credentials of the key, in addition to the mechanical blade.

Some electronic cylinders have the ability to keep an audit trail of the opening of the cylinder, so that it is known which key opened what door at what time of the day or night, giving another layer of key control.



FIGURE 2.29 Electronic Cylinder and Key
(Source: Courtesy of copyright © Medeco Security Locks)

European

European cylinders are uniquely shaped cylinders manufactured for locksets made in Europe. They have a round plug area similar to a conventional cylinder, with an elongated top portion where the pins and springs are, rather than a round housing all around.

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FIGURE 2.30 European Cylinder
(Source: Courtesy of copyright © Medeco Security Locks)

OPTIONS

High Security

The most expensive type of mechanical cylinder and key is high security. Similar to the security type, only those authorized to make duplicates at the time the original cylinders and keys were ordered are allowed to have copies made of those keys. Since the keys and cylinders are factory keyed and controlled, one would not be able to find a locksmith that would have the key blanks available to make duplicates, adding security to the cylinder and keys.

Additionally, high-security cylinders are drill and pick resistant. Not to say that they cannot be drilled through or picked, but it would take a long time to do so compared to standard, patented, or security cylinders, as the cylinder is made of a higher-density metal that would not allow a standard drill bit to penetrate easily. These types of cylinders are typically required to meet the standards of UL437, The Standard for Safety of Keyed Locks.

Interchangeable Core

Also known as a removable core, the interchangeable core is in the shape of a figure eight within the round face, or housing of the cylinder. Although costing more than a conventional cylinder, the figure eight core can be removed from the housing with a control key, which is unique and made specifically to do so. This can save time and labor costs when having to either rekey or replace the cylinder and keys for a particular lock or facility with numerous replacement requirements.

Large Format

Interchangeable cores are manufactured in two sizes, depending on the manufacturer and available options. Large format is the bigger of the two interchangeable core types, but it functions the same as the small format.

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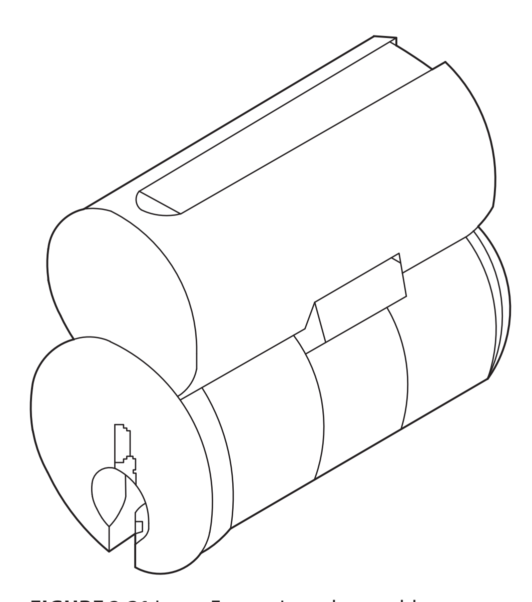


FIGURE 2.31 Large Format Interchangeable Core Cylinder
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.32 Large Format Interchangeable Core Cylinder
(Source: Courtesy of SARGENT® Manufacturing Company)

Patented

Patented mechanical cylinders and keys have a little more security and cost slightly more than standard type, where the cylinders cannot be duplicated at just any hardware store. One would have to know who holds the patent and has the ability to duplicate these keys by doing some research and tracking them down. Once it is known who has the ability to copy the keys, the security of patented cylinders is the same as that for standard ones—find the key blanks needed, which most hardware stores carry, and get the copies made, no questions asked.

Patented cylinders can also be "picked" easily, if the person attempting to do so has the experience. This is done by using fine metal tools inserted into the plug of the cylinder to manipulate the pins and springs to create the necessary shear line.

Security

Security mechanical cylinders and keys cost more than patented, but there is a big difference in security. Only those authorized to make duplicates at the time the original cylinders and keys were ordered are allowed to have copies made of those keys. Typically the parts are factory keyed and controlled, so one would not be able to find a locksmith that would have the key blanks available to make duplicates, adding security to the cylinder and keys.

Security cylinders are also manufactured with multiple layers of pins and springs, and additional side bar pins and springs that are difficult to pick.

Small Format

Small format is the smaller of the two interchangeable core types, but functions the same as large format.

Software

Some manufacturers offer software to assist with creating, managing, and maintaining keying mechanical systems. This software can typically be installed on any standard computer and can be very basic

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or comprehensive. Electronic cylinders and keys typically require unique software to manage the particular system. This software might also manage not just the keying system but also the entire security system or more, such as the entire building system, including fire alarms, HVAC (heating, ventilation, and air conditioning), lighting, and anything else that might be tied into the building's infrastructure.

Standard

Standard mechanical cylinders and keys are the least expensive and least secure type of cylinder. They are manufactured with single pins and springs, and the keys for these types of cylinders can be duplicated at just about any hardware store that makes keys. This is not ideal for a facility or opening that requires key control and security, knowing who has a key for that particular device or system at all time.

If someone with a standard cylinder and key knows they have a tendency to lose them, or wants to give copies to anyone they choose, they can simply go to a hardware store, find the key blanks needed, which most carry, and get the copies made, no questions asked.

Standard cylinders can also be picked easily, if the person attempting to do so has the experience. This is done by using fine metal tools inserted into the plug of the cylinder to manipulate the pins and springs to create the necessary shear line.

QUANTITIES

Cylinders are typically installed in singles on the secure or outside of the door or opening, unless the lockset's function requires two. If a function requires that a cylinder be installed on the inside of the door in addition to the outside, the function of the lockset can vary so that the cylinder locks or unlocks the inside in order to get out, which would typically be a code violation except for certain types of building occupancies. The other function would be that the cylinder on the inside of the door operates, or locks and unlocks the outside of the door, for instance in a classroom environment.

APPLICATIONS

Bored Lock

Also known as cylindrical locks, bored lock cylinders are used for bored or cylindrical type locksets. These cylinders are installed in the knob or lever handle, and either have a tail piece or match up to a turn piece in the chassis, or body of the locking device. This allows the key to turn and rotate the latch of the lockset in order to retract it so that the door can be opened.

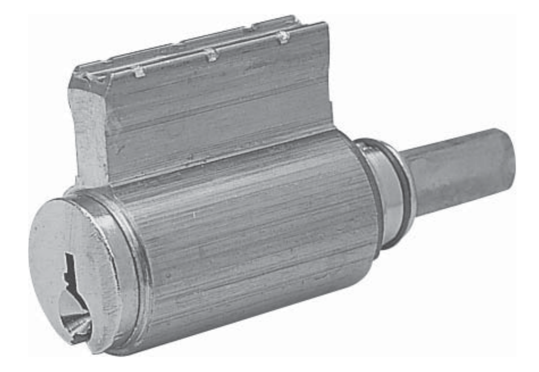


FIGURE 2.33 Key in Lever Cylinder
(Source: Courtesy of SARGENT® Manufacturing Company)

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Mortise

Mortise cylinders are most commonly used for mortise locksets, where the cylinder is recessed in a hole that matches the location of the cylinder hole in a mortise lockset.

Mortise cylinders are also used with mortise lock exit devices, mortise deadlocks, and key switches, which are used as an option to electronic access control systems to turn the system on and off fully. Unlike the rim cylinder, where a long tailpiece extends to operate the locking device, a mortise cylinder has a cam on the back, which rotates when the key is inserted and turned, and operates the locking device to retract the latch or deadbolt of the lockset.



FIGURE 2.34 Mortise Cylinder
(Source: Courtesy of SARGENT® Manufacturing Company)

Rim

Rim cylinders are available for various types of locking hardware, depending on how the devices are manufactured, and typically sit on the rim of the trim, not fully mortised into the door or locking device. The rim cylinder has a long tailpiece, which extends into the opening and locking device in order to lock and unlock it. They are used most commonly on rim locks, which are residential type locks that are used as a secondary device to the lever or knob lock, also known as a deadbolt, used to retract the main latch in order to open the door.

Rim cylinders are also required on certain types of exit hardware trim, again depending on how it is manufactured, again with the long tailpiece of the cylinder extending into the door and locking device in order to lock or unlock it.

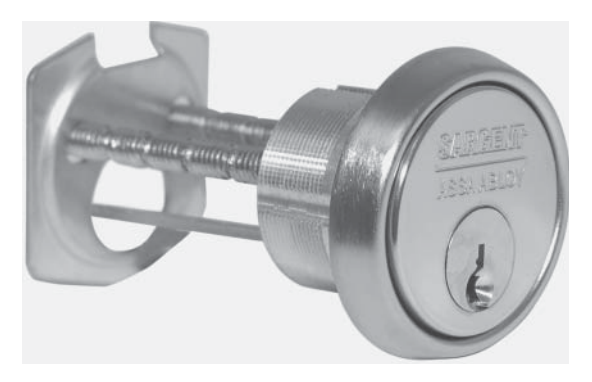


FIGURE 2.35 Rim Cylinder
(Source: Courtesy of SARGENT® Manufacturing Company)

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INSTALLATION

Cylinders are typically installed into the locking device, either into the lever or knob handle, the surface-mounted locking device, or directly into the face of the door if the locking device is mortised into the door. Cylinders are typically manufactured specific to the manufacturer of the locking device and will not typically work in another manufacturer's device without modification, and even if they do, they might not work properly or for very long. With that said, there are some manufacturers that make their cylinders to operate in another manufacturer's device intentionally, and in that case the cylinder should operate just as if it were made by the original locking device's manufacturer. There are also third-party cylinder manufacturers that only make cylinders to operate in other manufacturers' locking devices, as they do not manufacture locking devices themselves.

Fasteners

Depending on the type, cylinders are typically fastened into the locking device with screws from behind, by a set screw on the side, or simply by securing them tightly inside of a handle or knob without room to move. Cylinders are typically furnished with their respective fasteners, depending on the type and application.

Locations

Cylinders are typically installed into the locking device on the face of the door at locations recommended by the manufacturer, industry standards, and codes. The locations are typically measured from the finished floor.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the locking device and cylinders installed at various heights, depending on the locking device type. Knob and lever handle locksets, as well as exit device trim are recommended to be installed with a centerline of 40 5/16 inches above the finished floor, while deadlocks are recommended to be installed with a centerline of 48 inches above the finished floor.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have the locking device and cylinders installed at various heights, depending on the locking device type. Knob and lever handle locksets, as well as exit device trim, are recommended to be installed with a centerline of 38 inches above the finished floor, while deadlocks are recommended to be installed with a centerline of 46 inches above the finished floor.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors and frames are recommended to have the locking device and cylinders installed at various heights, depending on the locking device type. Knob and lever handle locksets, as well as exit device trim, are recommended to be installed with a centerline of 40 5/16 inches above the finished floor, while deadlocks are recommended to be installed with a centerline of 48 inches above the finished floor.

Preparations

When installed into a mortise locking device directly into the face of the door, cylinder preparations can be machined at the factory as recommended, but this is sometimes accomplished in the field by the installer. When installed into a knob or lever handle device, the cylinder hole is in the hardware, which is on the face of the door, so a separate preparation hole is not required.

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DOOR POSITION SWITCHES

Also Known As: Door Contacts, DPS, Door Status Switch, Magnetic Contact

DESCRIPTION

Although it could be as simple as a single device trigger depressed by a door when it closes into a frame, the typical door position switch is a magnetic device that is wired to an alarm and/or computer system. A typical application would signal when the door is in the open position and not properly in the frame.

The newest in electromechanical locking devices is to have a door position switch built into the locking device itself. With that said, the door position switch signal does not necessarily mean that the door is latched, locked, and secure, but there are other devices that can assist with that including a latch position switch and electromechanical locking devices. The signal can be sent one or more ways, including as a local alarm at the door, a remote alarm at one's computer, or a text message to a cell phone.

PROPERTIES

Door position switches are typically manufactured from metal, plastic, and wire components and are usually to be housed in a plastic body.

Finishes

Door position switches can typically be found with white, gray, tan, brown, and black plastic finishes. Heavy-duty door position switches are typically manufactured with a metal housing and finish.

Grades

Door position switches are not referred to in grades and the quality is described by operation and the UL tests that they pass in order to comply with standards for operation.

Materials

Door position switches are typically manufactured with a plastic body or housing with metal and wire components inside. Heavy-duty door position switches are typically manufactured with a metal housing in lieu of plastic with a heavy-duty metal casing surrounding the wires.

Shapes

Both surface-mounted and concealed type door contacts are available from various manufacturers in a rectangular shape, while concealed ones are also available in a round shape.

TYPES

Magnetic

The magnetic door position switch is installed with two parts as a set with the primary intent to monitor and signal the state of the opening. One of the two parts of the switch is installed on the door and one on the frame, which line up and make contact when the door is in the closed position in the frame.

Trigger

The trigger door position switch is typically installed with one part on the frame. When the door swings closed and rests against the trigger, which can be a roller ball for example, that would indicate that the door is in the closed position in the frame.

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OPTIONS

Other than finish and installation options such as surface-mounted or concealed, there are no options available for the door position switch.

QUANTITIES

Trigger door position switches are typically installed as a single unit surface-mounted on or mortised into the frame. Magnetic door position switches are typically installed as a set with two parts, one surface-mounted on or mortised into the door frame and one surface-mounted on or mortised into the door to match the frame installation.

APPLICATIONS

Concealed

Concealed door position switches are typically installed with new construction applications and are not visible unless the door is in the open position in the frame.



FIGURE 2.36 Concealed Door Position Switch

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

Surface Mounted

Surface-mounted door position switches are typically installed with retrofit applications and are installed onto the face of the door and frame.

INSTALLATION

Surface-mounted door position switches are typically installed on the face of the door and frame and can be mounted anywhere on the typical three-sided perimeter of the door opening in the frame, but are typically installed along the top end.

Concealed door position switches are typically installed in the center of the head of a door and frame and cannot be seen when the door is in the closed position in the frame.

Fasteners

Door position switches are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat head are available depending on the

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manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Door position switches should be coordinated between the door, frame, and hardware supplier and installed at locations as recommended by the manufacturer.

Preparations

Door position switch preparations for concealed devices are typically machined at the factory while surface-mounted installations are typically done in the field. Due to the surface mount, no preparations other than drilling and tapping the screw holes are required.

DUMMY TRIM

Also Known As: Dummy Handles, Dummy Levers, Dummy Knobs, Inactive Trim

DESCRIPTION

Dummy handles are rigid handles that do not operate and are typically installed on the inactive leaf of a pair of doors. Dummy trim can also be used as a pull handle on an active door.

PROPERTIES

Dummy trim is made up of components such as a handle, rosette or escutcheon, mounting hardware, and spindle that come together to create the dummy trim.

Finishes

Depending on the manufacturer's availability, dummy trim is typically available in all architectural hardware metal finishes, while some manufacturers might offer special materials and finishes like plastic. Depending on the aesthetic and cost choices made, dummy trim is typically specified with finishes to match the hanging and/or other hardware on the opening.

Grades

ANSI/BHMA A156 American National Standards for the various types of latching and locking devices all refer to grades 1, 2, and 3. The minimum standards for each type of test vary depending on the latchset or lockset type. The testing includes operational tests such as torque and strength, security tests such as impact and tension, and cycle and finish tests.

Be sure to check each item delivered against the approved specifications and submittals for compliance of quality. Imagine getting a grade 3 product when specifying a grade 1 due to poor substitution practices.

Materials

Latchsets and locksets are manufactured from many parts that can be made of various materials, depending on the manufacturer's standards. Some materials used to manufacture latchsets, locksets, and their components include iron, copper, steel, stainless steel, brass, bronze, and zinc.

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Sustainability

Dummy trim can possibly help contribute to sustainability with its pre- and postconsumer recycled content, contributing to the overall material in the building. Using a factory finish and or not painting or coating the dummy trim on site can also help contribute to obtaining credits toward building a green structure.

TYPES

Bored

Also known as cylindrical, single-bored dummy trim is typically not bored into the door but is installed onto a mounting plate that is attached to the face of the door. With that said, there are some manufacturers that require additional cutouts for reinforcement and pair dummy trim might connect with a back-to-back installation through the door. Bored dummy trim has a limited choice of lever designs; there are typically three or four from which to choose.

Gate

A gate lock or latch is a small surface-mounted rim lockset or latchset that is typically used to keep a door opening in a gate from swinging freely.

Mortise

Mortise dummy trim is typically not mortised into the door but is installed onto a mounting plate that is attached to the face of the door. With that said, there are some manufacturers that require additional cutouts for reinforcement and pair dummy trim might connect with a back-to-back installation through the door. Mortise dummy trim comes in many choices of lever designs, typically the same choices as the locking devices from the same series.

Tubular

Tubular dummy trim is typically not bored into the door but is installed onto a mounting plate that is attached to the face of the door. There are some manufacturers, however, that require additional cutouts for reinforcement and pair dummy trim might connect with a back-to-back installation through the door. Tubular dummy trim has a varied number of choices of lever designs—anywhere from just a few to several dozen depending on the manufacturer.

OPTIONS

Single

Dummy trim is available in single quantities for one side of the door installation. They are typically surface-mounted or can be reinforced inside of the door, depending on the door and hardware manufacturer's recommendations.

Double

Dummy trim is available in double or pair quantities for both sides of the door installation. Depending on the manufacturer and type, they can be surface-mounted or mounted back to back, where they are connected to each other through the door, but still do not rotate or operate any other device or mechanism.

Decorative

Trim can also be an aesthetic component of the panic or fire exit hardware outside trim. Some manufacturers offer many lever handle design choices for all hardware types; some have suites that

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allow consistent design on all hardware types, including panic and fire exit hardware. Other matching lever types include mortise locksets, electronic access control locksets, and tubular passage, privacy, and dummy trim. There are also suites of hardware available that include lever handles for locksets, pull handles for glass and sliding doors, drawer pulls, door stops, coat hooks, and hinges. With coordination, this would give the entire opening, interior, and building a consistent door opening design.

Escutcheon

An escutcheon is a backplate to the trim and, if one is used, it is a cylinder on the outside and thumbturn on the inside of the door. Escutcheons can be rectangular, oval, or custom in shape and be installed flush, with a pattern or with framed edges.



FIGURE 2.37 Escutcheon Options
(Source: Courtesy of SARGENT® Manufacturing Company)

Heavy Duty

Heavy-duty dummy trim is available for very frequently used door openings that might need to withstand high abuse. This trim is typically very strong and will outlast conventional-duty trim.

Knob

Knob trim is available for the outside operation of panic and fire exit hardware. Knobs are typically round, although some custom knobs might be more oval or square. In 1992, lever handles became the new standard, as knobs no longer met the requirements of or complied with ADA.

Lever

Lever trim is available for dummy trim hardware. Typically elongated and horizontal across the door face at the door lock edge, lever handles have many designs and choices in aesthetic. Some manufacturers offer lever trim designs for their dummy trim, consistent with panic and fire exit hardware, and locking device offerings such as mortise locksets or electronic access control locking hardware.

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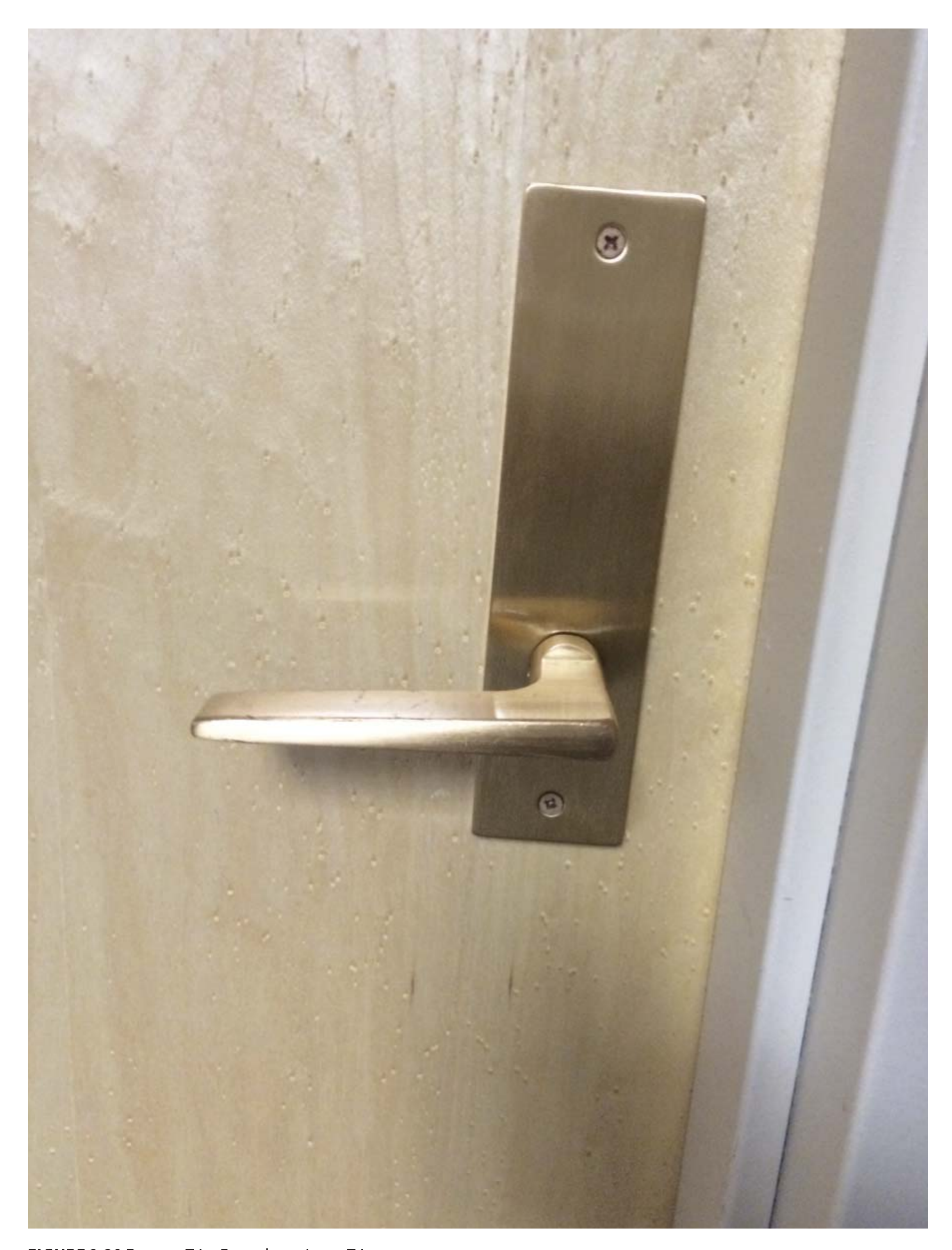


FIGURE 2.38 Dummy Trim Escutcheon Lever Trim
(Source: Courtesy of Scott J. Tobias)

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Lever handle trim became the new standard in 1992, in order to meet the new ADA standard and requirements. These and current requirements roughly state that doorways cannot be operated by a twisting or pinching motion, which is how a doorknob is conventionally operated. With a lever trim, you can lean on the lever and still retract the latch to operate the door.

Certain codes require that the lever have a return to the door at its end, with no more than ½-inch clearance between the end of the return and the door face. This is to prevent anything from getting caught behind the lever handle, such as clothing or a fire hose prior to being filled with water.

Pull

Pull trim is a good option for panic and fire exit hardware for heavy-duty applications, but it is more commonly used as a simple pull handle, which, in essence, is a dummy trim.



FIGURE 2.39 Dummy Trim Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

Rigid

Rigid trim is trim that does not move and is always fixed in one position. Examples of rigid trim are pull handles and dummy trim.

Rosette

A rosette is a backplate to the trim on both the outside and inside of the door. Rosettes can be rectangular, round, oval, or custom in shape as well as flush, with pattern, or having framed edges.

QUANTITIES

One type of dummy trim can be installed as a single-sided application or two types can be installed as a double or back-to-back application.

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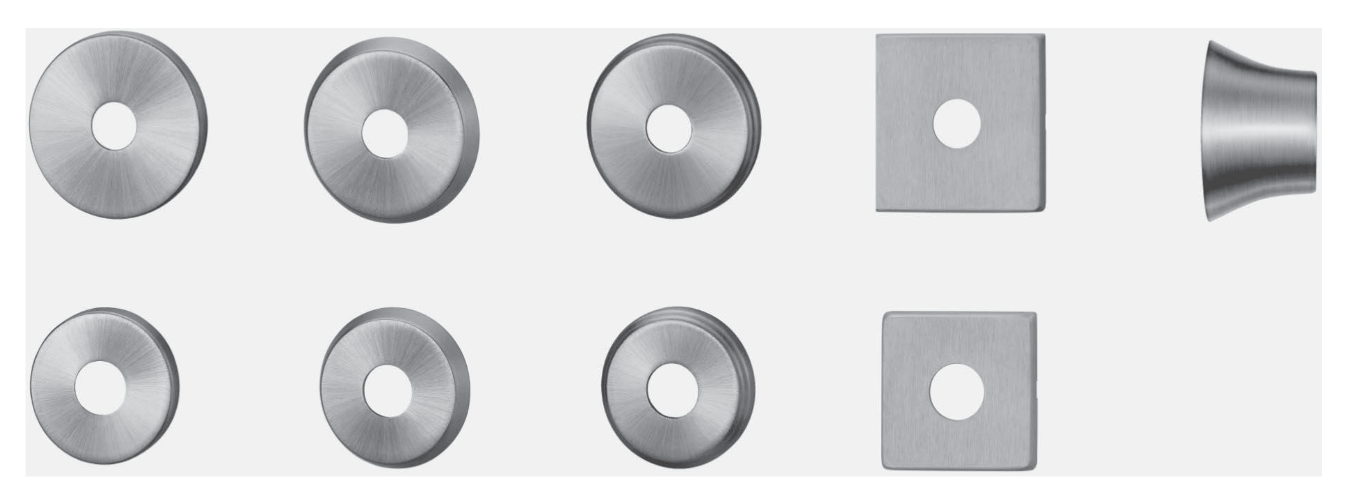


FIGURE 2.40 Dummy Trim Rosette Options
(Source: Courtesy of SARGENT® Manufacturing Company)

APPLICATIONS

Dummy trim can be installed for aesthetics or function. A single aesthetic can be used as a pull for a closet with a roller latch as the securing method. Dummy trim can also be installed as a double or back-to-back installation on the inactive leaf of a pair of doors for either aesthetics or, as on a functioning swinging door, as a pull on both sides of the door.

INSTALLATION

Dummy trim can be installed as either a single aesthetic piece or as a pair. Single dummy trim is typically surface-mounted on a mounting plate on the face of a door. Double dummy trim can be surface-mounted on both sides of the same door or the two pieces can be connected to each other and placed back-to-back through the door.

Dummy trim is not allowed by life safety egress codes on the inactive leaf of a pair of doors in the path of egress. The reason for having no trim is so that the person trying to exit the space does not have to think about or choose the correct handle. If someone is in a panic trying to exit a space and fixates on the inactive dummy handle, he or she could waste time trying to turn a handle that will never move or get the door to open. By having only one operable choice in the path of egress the chances of getting through the opening are greater.

If dummy trim is being installed on a stile and rail door, always confirm the lock stile dimension to ensure that there is enough room to install the dummy trim.

Fasteners

Sometimes installed through the door or with a side preparation for a more secure installation, dummy trim is typically positioned on a mounting plate that is installed onto the door with screw fasteners. Fasteners are available for wood or metal door and frame material. Phillips and flat-head screws are available depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

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Locations

Although dummy trim can act as a door pull, it should be installed at locations as recommended by industry standards and codes, which are typically measured from the finished floor. Depending on the door and frame type, whether considered standard or custom metal, wood, or aluminum, standards recommend starting the first hinge from the finished floor.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the dummy trim installed at 40 5/16 inches, which coincides with the centerline of the strike on the frame.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have the centerline of the dummy trim installed at 38 inches.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors are recommended to have the dummy trim installed at 40 5/16 inches, which coincides with the centerline of the strike on the frame.

Preparations

Single dummy trim preparations are typically completed in the field by the installer, including the drilling and tapping of screw holes, whereas double or back-to-back dummy trim preparations might be completed at the factory.

ELECTRIC STRIKES

Also Known As: Release Device

DESCRIPTION

Electric strikes can be used to regulate who passes through door openings and access points. Unlike an electrified lockset or exit device that still needs to have the latch retracted once unlocked electronically, an electric strike keeper, where the latch of the lockset is held, releases and allows the latch to pull away from the strike rather than being retracted from it.

Although they are used often, it is recommended that electric strikes not be your first choice for security unless this is necessary in a retrofit environment, as they are not as robust as electromechanical locking devices. Electric strikes are ideal for traffic control or for keeping audit trail records of an opening.

PROPERTIES

Electric strikes have a keeper, which is where the latch of the locking device engages. The strike keeper releases the latch when operated so that the locking device, including the latch, can be pulled out of the strike keeper without rotating the lever of the locking device itself.

Finishes

Electric strikes are typically available in a limited number of the basic finishes, depending on the manufacturer. The finish of the device is typically a cover plate that covers the exposed edge of the electric strike.

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Grades

Electric strikes are tested and graded with levels of 1, 2, and 3 by ANSI/BHMA with 1 being the highest and best performing. The tests for grade include cycle and strength tests.

Materials

Electric strikes are typically manufactured from metal, plastic, and wire materials that operate inside of a metal or plastic housing.

TYPES

Rim

Rim electric strikes are surface-mounted on the stop of the frame strike jamb where the mechanical rim latch strike would be.

Semi-Rim

Semi-rim electric strikes are mortised into the frame strike jamb where the mechanical rim latch strike would be. The keeper is extended out to accommodate the location of the rim latch on the exit hardware device.

Mortise

Mortise electric strikes are mortised into the jamb of the frame strike, where the mechanical latch strike would be, aligned so that the keeper of the strike accepts the latch of the locking device.



FIGURE 2.41 Rim Device Electric Strike

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)



FIGURE 2.42 Electric Strike

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FIGURE 2.43 Electric Strike

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

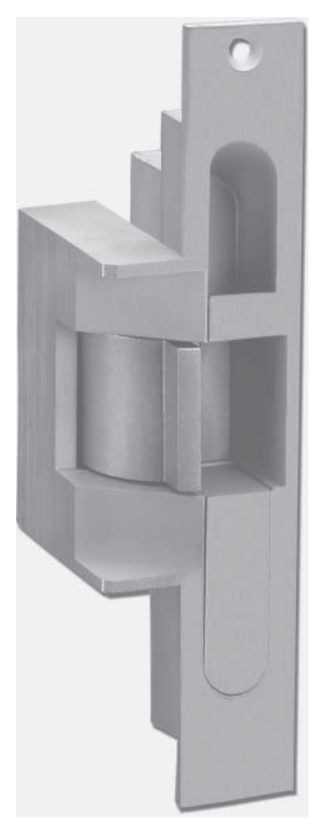


FIGURE 2.44 Mortise Lock Electric Strike with Deadbolt

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

The electric strikes for use with locksets and mortise exit hardware devices require a mortise latch keeper, which is typically mortised into the frame strike jamb where the mechanical mortised latch strike would be. This strike, depending on the manufacturer, might have the option to accept the deadbolt in addition to the latchbolt of the locking device.

Vertical Rod

SINGLE

Single vertical rod exit device electric strikes are mounted on the jamb of the head where the single mechanical vertical rod latch strike would be.

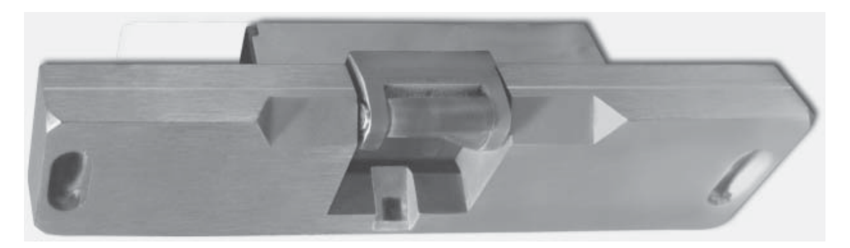


FIGURE 2.45 Electric Strike for Vertical Rod Exit Device

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DOUBLE

Double vertical rod exit device electric strikes are mounted on the jamb of the head where the pair of mechanical vertical rod latch strikes would be.



FIGURE 2.46 Electric Strike for Vertical Rod Exit Device

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

OPTIONS

Connectors

Electronic hardware has historically been connected by twisting wires together, but now there are plastic connectors that are prewired by the manufacturer so that their hardware will connect easily by plugging the devices together. Such connections are available on hinges that connect to door harnesses that carry power across the door to the locking device.

Ampere (Amp)

An ampere (amp) is a measure of the amount of electric charge passing a point in an electric circuit. In other words, it is the speed that the electricity travels through a device, wire, and system.

Current

Current requirements differ by manufacturer and device. Available as alternating or direct current, electrical devices must be coordinated correctly in order to have proper operation and function.

ALTERNATING CURRENT (AC)

Alternating current (AC) is the typical power used in homes and standard outlets. The current is sent to and from the device, in alternating directions. If you ever noticed a buzzing sound at a door with an electric strike when power is sent to it, you are likely hearing the alternating current running through the device.

DIRECT CURRENT (DC)

Direct current (DC) can eliminate the buzzing sound and is typically a one-way current similar to that of a battery and does not create the buzzing sound.

Extended Lip

Depending on the manufacturer, electric strikes are available with the option to extend the lip of the strike. This would be necessary if the door were not flush with the edge of the door and inset into a reveal in the frame. This would give the latch a plate to rub against as it swings in and out of the reveal in the frame instead of possibly scraping against the frame paint or finish and possibly scratching it.

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Open Back

Open-back strikes are used with pairs of doors, allowing what would normally be the inactive leaf, if flushbolts were used, to be independent of the active leaf and able to operate on its own. An example is a pair of doors with the active door having a mortise lock exit device while the inactive door has a vertical rod device allowing egress only. In this case, the inactive door could operate from the egress side independent of the active door, and the open-back strike would allow the active door mortise lock device to latch without the use of a coordinator.

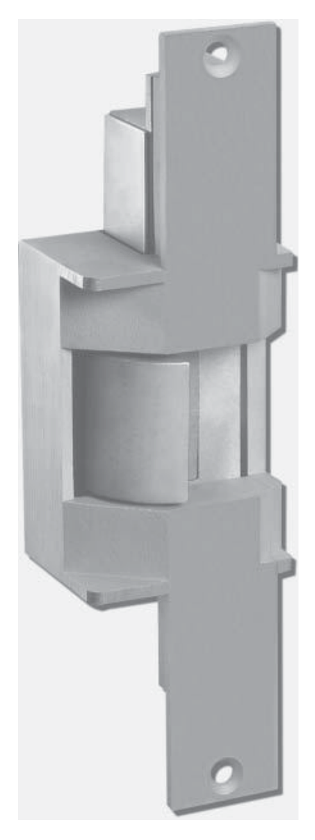


FIGURE 2.47 Open-Back Electric Strike

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

Fail Safe

Fail-safe strikes are available to tie into a fire alarm system. This trim only locks when power is applied to the opening and unlocks when power is released. This function uses power all of the time but is necessary to meet the codes in certain situations, if electrification is necessary at the opening. The devices are manufactured differently, depending on the manufacturer and options, and can be operated by solenoid or a motorized mechanism, which would retract and throw the bolt accordingly, or simply allow the lever or knob to be rotated to retract the latch manually.

Fail Secure

Fail-secure strikes are available for locking and unlocking a device. This trim only unlocks when power is applied to the opening and locks when power is released. This device uses less power than a fail-safe device, as the power is only used when necessary to open the device. The devices are manufactured differently, depending on the manufacturer and options, and can be operated by solenoid or a motorized mechanism, which would retract and throw the bolt accordingly, or simply allow the lever or knob to be rotated to retract the latch manually.

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Voltage

Voltage requirements differ by manufacturer and device. Available with various voltages such as 12 VAC or DC, and 24 VAC or DC, devices must be coordinated correctly in order to have proper operation and function. With that said, there are manufacturers that have devices that operate with multiple voltages, so one would not need to coordinate them when purchasing the devices, but you should do so when installing them, to be certain there are no errors and the devices are not ruined and left unusable.

QUANTITIES

Electric strikes are installed in single units with one strike per latch.

APPLICATIONS

Surface-Mounted

Electric strikes for use with rim exit hardware devices require a rim latch keeper, which is typically surface-mounted on the stop of the frame strike jamb where the mechanical rim latch strike would be.

Electric strikes for use with vertical rod exit devices are mounted on the jamb of the head where the mechanical vertical rod latch strike would be.

Mortised

Electric strikes for use with locksets and mortise exit hardware devices require a mortise latch keeper, which is typically mortised into the frame strike jamb where the mechanical mortised latch strike would be.

INSTALLATION

An electric strike is typically installed on the frame or on the inactive leaf of a pair of doors, and the latchbolt and/or deadbolt of the locking device is secured in the keeper of the strike. The latchbolt of the locking device can be pushed through the keeper of the electric strike once the strike is released, without requiring the latchbolt to be retracted by the handle or knob as with mechanical strikes.

If an electric strike is being installed on a stile and rail door, always confirm the lock stile dimension to ensure that there is enough room to install the strike.

Fasteners

Electric strikes are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Electric strikes should be installed at locations as recommended by industry standards and codes, which are typically measured from the finished floor. Depending on the door and frame type, whether it is considered standard or custom metal, wood, or aluminum, standards recommend starting the first hinge as measured from the finished floor.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the centerline of the strike on the frame installed at 40 5/16 inches.

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CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have the centerline of the strike on the frame installed at 38 inches.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors are recommended to have the strike on the frame installed at 40 5/16 inches.

Preparations

Electric strike preparations are typically machined at the factory, including the drilling and tapping of screw holes. With metal doors and frames, the preparation is typically a cutout in the location where an electric strike will be installed.

PANIC AND FIRE EXIT HARDWARE

Also Known As: Crash Bars, Exit Hardware, Panic Hardware

DESCRIPTION

Although similar in function and appearance, there is a major difference between panic hardware and a fire exit device, whether or not they are specified and installed on a fire rated door.

Panic hardware is typically used for life safety, egress, and occupancy requirements. While fire exit devices are typically used for the same reasons, in addition the door opening is fire rated. These devices were tested in accordance with fire rating requirements and will bear the fire rated symbol to verify it they are compliant.

Another difference between the devices is that panic hardware can be “dogged” in the open position and a fire exit device cannot be. As mentioned earlier, a fire rated door must secure itself into the door frame on its own when a fire occurs, and a fire rated dogged device would require the assistance of someone to make that happen.

With that said, there is an option available from some manufacturers to electrically dog a device, where the bolts are retracted and held electronically, typically by a solenoid, which is magnetic. This device is wired, or tied, into the fire alarm system, and when the fire alarm is engaged, the power is cut, the solenoid releases, the bolts retract, and the door is engaged and secured into the frame as required at the time of the fire.

PROPERTIES

Panic and fire exit hardware can be manufactured with various configurations, aesthetics, functions, and options.

Actuating Bar

There are three main types of panic and fire exit hardware actuating bars, which are depressed to retract the latches of the device, allowing egress. As you can see from Figure 2.48, the actuating bars have very different aesthetics and angles of projection from the face of the door.

There are some newer, simple, more aesthetically designed devices available that might meet egress standards and codes for panic, but not necessarily fire exit requirements.

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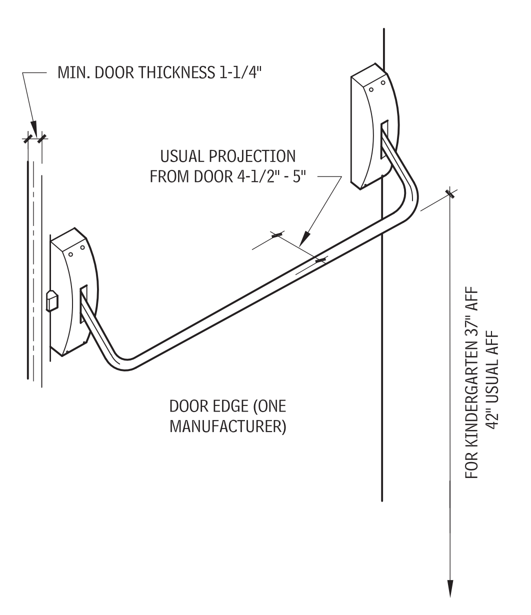


FIGURE 2.48 Crossbar Exit Device

(Source: The Graphic Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)



FIGURE 2.49 Crossbar Exit Device

(Source: Courtesy of SARGENT® Manufacturing Company)

CROSSBAR

The crossbar actuator is the original panic and fire exit hardware design, which looks like a tubular bar installed horizontally across the face of the door. The crossbar can be depressed fully to retract the latchbolts, allowing the door to be pushed open.

Although aesthetically pleasing, crossbars can present issues as some building occupants (or even staff) will chain them together for security purposes. This is obviously not allowed by code, especially as the means of egress.

TOUCHPAD

The touchpad actuator is the newer of the designs available and looks like a rectangular pad installed horizontally across the face of the door. At least half of the touchpad depresses (required by code) when pushed to retract the latchbolts, allowing the door to be pushed open.

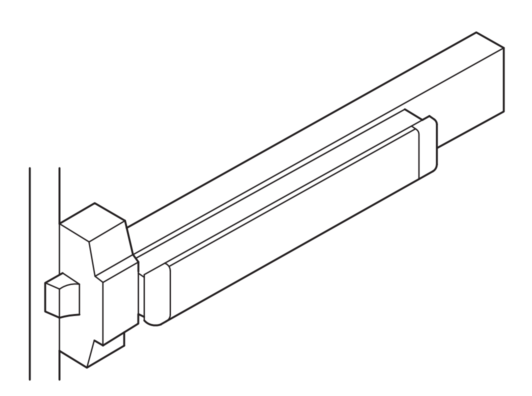


FIGURE 2.50 Crossbar Exit Device

(Source: The Graphic Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)



FIGURE 2.51 Touchpad Exit Device

(Source: Courtesy of SARGENT® Manufacturing Company)

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FIGURE 2.52 Integrated Exit Device
(Source: Courtesy of copyright © 2002–2013, Adams Rite, an ASSA ABLOY Group Company)

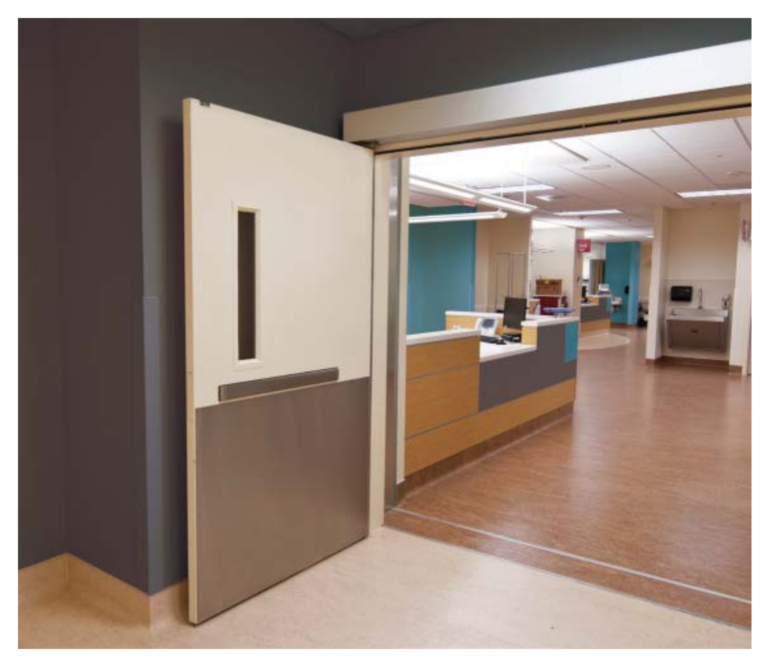


FIGURE 2.53 Integrated Exit Device
(Source: Courtesy of copyright © 2002–2013, Adams Rite, an ASSA ABLOY Group Company)

INTEGRATED

Integrated actuators are similar to the touchpad design, rectangular in shape, except they are installed as part of the door, recessed in a preparation rather than being surface-mounted on the face. These devices are typically installed at the factory by the door manufacturer, hence the name "integrated."

Chassis

The chassis is where the latchbolt is housed, and it is operated by the actuator. Depending on how the device is manufactured, the chassis can be engaged by the actuator from the side or face of the chassis.



FIGURE 2.54 Exit Device Chassis
(Source: Courtesy of SARGENT® Manufacturing Company)

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FIGURE 2.55 Wrapped End Cap on Exit Device
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.56 Flush End Cap on Exit Device
(Source: Courtesy of SARGENT® Manufacturing Company)

The chassis is typically protected by a cover, which is usually in the same architectural finish as the rest of the device and door hardware specified.

End Cap

End caps are typically installed at the hinge side end of the exit device. They can be flush with the end of the device or wrap around, depending on the manufacturer and the options offered.

Finishes

Visible parts of an exit device are available in most architectural finishes, depending on the manufacturer and their availability.

Grade

Exit devices are available in different grades, cited as grade 1, 2, and 3, with grade 1 being the highest-quality grade. Testing is different for interior and exterior openings. The following are a few of the interior tests and standards per ANSI/BHMA A156.3 American National Standard for Exit Devices, 2008.

CYCLE TEST

Cycle tests ensure the longevity of a device for a certain amount of cycles, during which the device is activated and the latchbolt is retracted.

GRADE 1

Grade 1 exit devices require 500,000 cycles of operation.

GRADE 2

Grade 2 exit devices require 250,000 cycles of operation.

GRADE 3

Grade 3 exit devices require 100,000 cycles of operation.

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EXIT TEST

Standard

All grades require a 15-pound maximum depression force of the actuating bar.

Forced

All grades require a 50-pound maximum depression force of the actuation bar when 250 pounds of horizontal force is applied to the door, binding the latchbolt.

Materials

Exit device parts, including internal working parts, actuating bars, chassis, trim, rods, and strikes, can be manufactured from brass, bronze, stainless steel, or steel depending on the manufacturer and device.

Sizes

Exit devices are available in various sizes for door width and door height. The minimum width available for an exit device is 2 feet. The maximum width available for an exit device is 4 feet, and the actuating portion of the bar across the door must be at least half of the width of the door, while the maximum height for a vertical rod exit device is 10 feet.

There are very specific size and application requirements and compliances, so be certain to check with the local codes and standards, as well as the availability with the manufacturer.

Strikes

Strikes are the keeper for latches of panic and fire exit hardware. Depending on the device and latch type, there are strikes available to suit each. They are typically furnished with the device along with fasteners and other required parts.

TYPES

Rim

Rim devices are the most secure, easiest to install, and least expensive of the types. They install fully on the inside of the opening, and the latch can be neither seen nor tampered with through the clearance on the door's latch side.

NARROW

Narrow stile devices are available to suit narrow stile doors with less than 2 inches of stile dimension for the chassis to mount onto.

STANDARD

Standard stile exit devices are available to suit stiles 3 inches or wider for the chassis to mount onto.

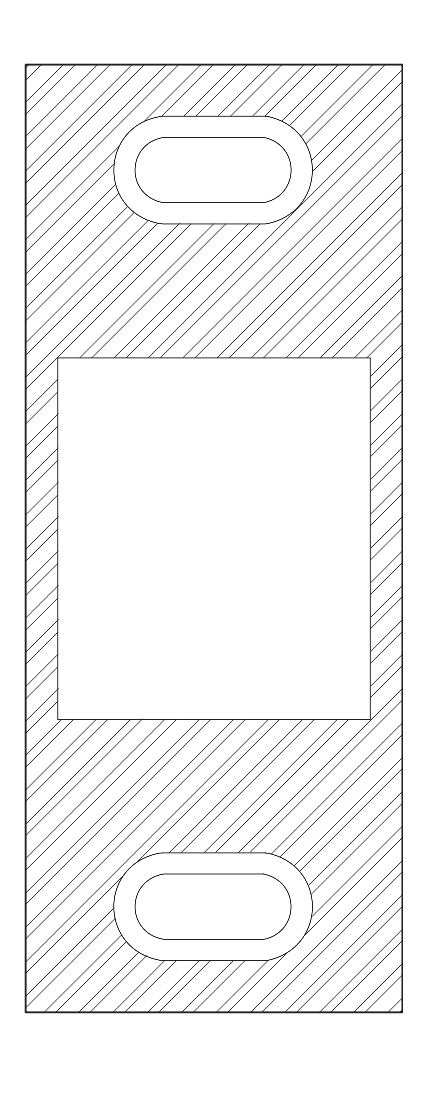
Mortise

Although it has more parts, a bigger body inside the door, and costs more, the mortise lock is not as secure as a rim device. Unlike the rim device, one can see the latchbolt through the clearance at the latch side of the frame, tamper with it, and possibly damage it.

Vertical Rod

Few people find surface-mounted vertical rod devices beautiful. In addition to taking away from the opening's design, these hardware components can be a maintenance nightmare, and the latches will have to be adjusted regularly, depending on the frequency of use.

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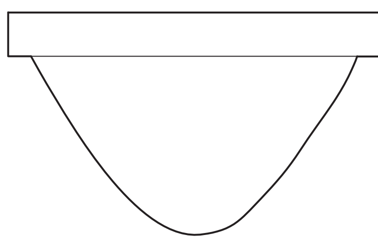
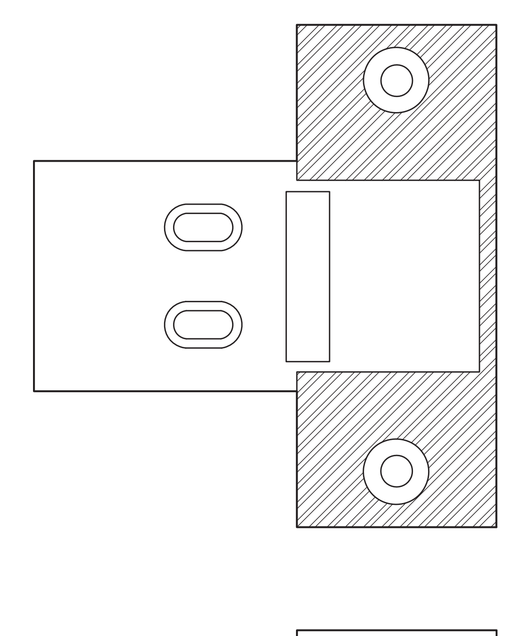


FIGURE 2.57 Rim Exit Device Strike
(Source: Courtesy of SARGENT® Manufacturing Company)



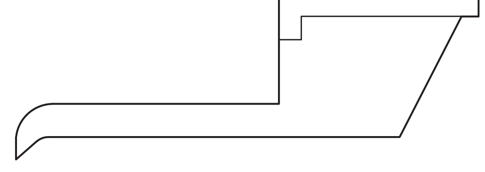


FIGURE 2.58 Rim Exit Device Strike
(Source: Courtesy of SARGENT® Manufacturing Company)

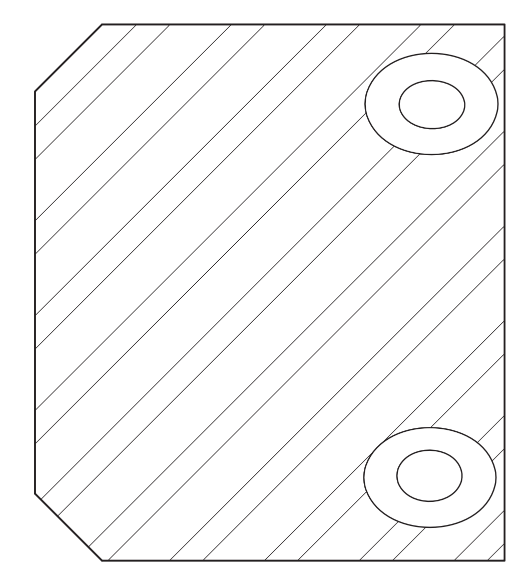


FIGURE 2.59 Rim Exit Device Strike
(Source: Courtesy of SARGENT® Manufacturing Company)

CONCEALED VERTICAL TOP AND BOTTOM RODS

Concealed vertical rods are similar to surface-mounted ones, except the rods are hidden inside of the door opening. This helps with the aesthetics, but like surface-mounted rods, this hardware can be a maintenance nightmare, even more so than the surface-mounted rods, because the adjustment typically cannot be completed while the door is hanging in the opening. The door will have to be

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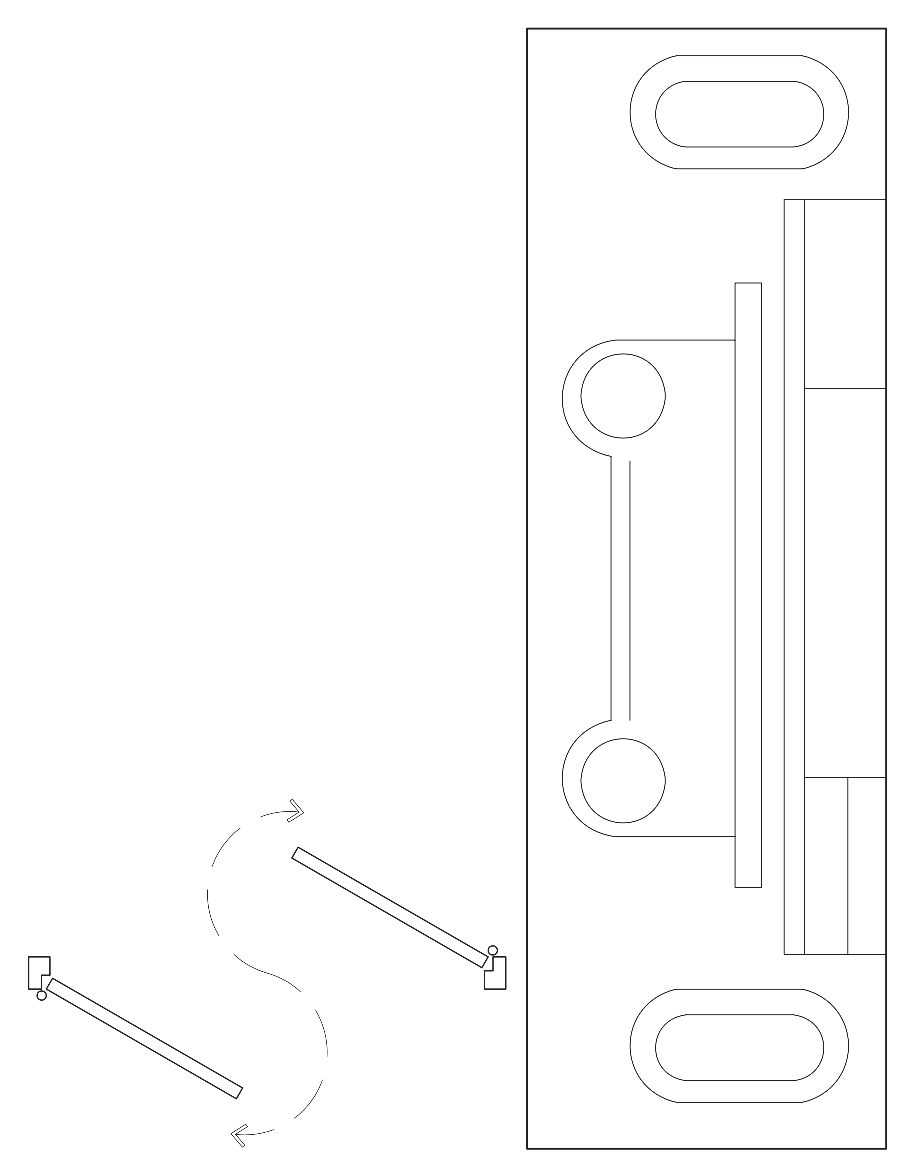


FIGURE 2.60 Rim Exit Device Strike
(Source: Courtesy of SARGENT® Manufacturing Company)

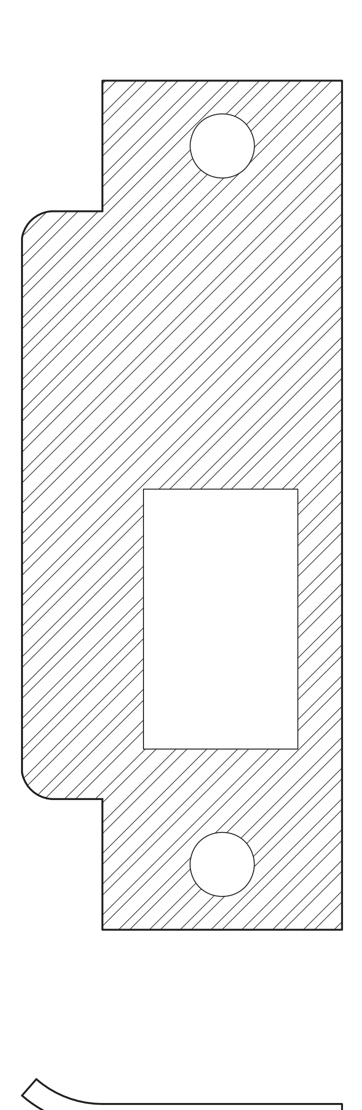
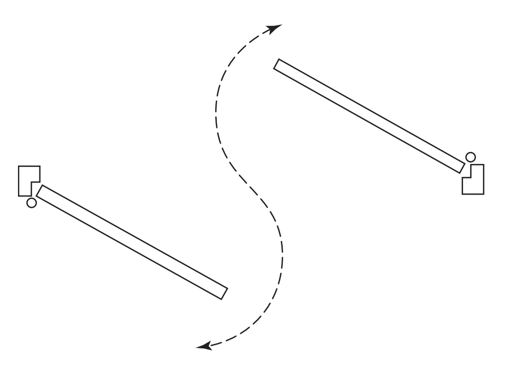


FIGURE 2.61 Mortise Exit Device Strike
(Source: Courtesy of SARGENT® Manufacturing Company)



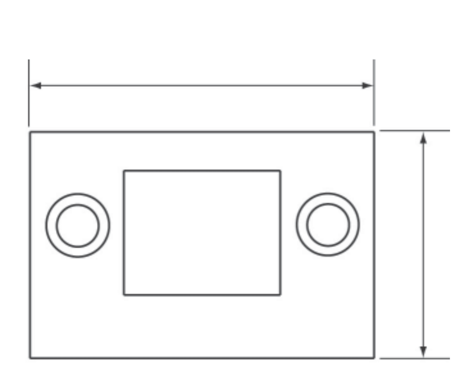


FIGURE 2.62 Surface Vertical Rod Exit Device Strike
(Source: Courtesy of SARGENT® Manufacturing Company)

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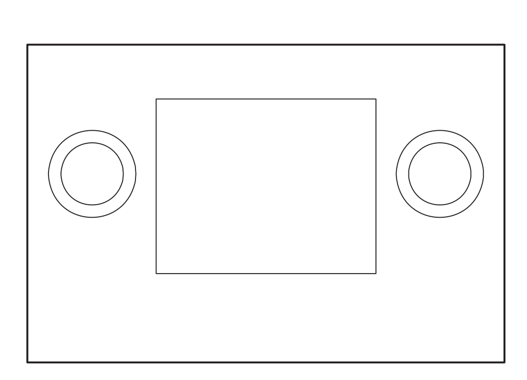


FIGURE 2.63 Surface Vertical Rod Exit Device Strike
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.64 Narrow Rim-Mounted Exit Device
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.65 Rim Exit Device
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.66 Mortise Lock Exit Device
(Source: Courtesy of SARGENT® Manufacturing Company)

taken down from its hanging device; the latches will have to be adjusted regularly, depending on the frequency of use, and the door rehung accordingly.

Since the latch adjustments cannot be tested while the door is out of the opening, if they are not sufficient, the door will have to be taken down again and the cycle will continue until the adjustments are correct, which can waste a lot of resources and labor.

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FIGURE 2.67 Surface Vertical Rod Exit Device
(Source: Courtesy of SARGENT® Manufacturing Company)

SURFACE TOP AND BOTTOM RODS

Surface vertical rod devices were originally offered as top and bottom, with the rods extending from the cross- or touch bar at the center of the door, extending the entire height of the door opening, and latching into strikes at the head of the frame and floor.

SURFACE TOP ROD ONLY

Recent code changes do not allow anything to protrude off the face of the door for certain distances from the finished floor. These codes do not allow the bottom rod to be installed, and manufacturers have made modifications that have passed the tests to certain extents, allowing them to be installed on doors with the top rod only.



FIGURE 2.68 Surface Vertical Top Rod Exit Device
(Source: Courtesy of SARGENT® Manufacturing Company)

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OPTIONS

Anti-Microbial Coating

Exit devices are available with an optional anti-microbial coating. The coating is a silver ion–based clear coating that helps stop the spread of bacteria. Although there are silver ions, they are not visible to the eye and a brass or bronze finish shows its true color through the coating. Silver has been used throughout history to help reduce the spread of bacteria and infection; why not put it on doors and hardware that is touched over and over again by numerous different people in a day?

Auxiliary Control

An auxiliary control is an option to lock and unlock the door from the outside, or pull side of the door, with a key and thumb turn where there are no lever handles or pulls but access might be required or desired. The cylinder unlocks the thumb turn and allows the rotation of the thumb turn, which retracts the latches of the exit device. This type of device might be questioned for ADA compliance.

Connectors

Electronic hardware has historically been connected by twisting together wires, but now there are plastic connectors that are prewired by the manufacturer so that the hardware, at minimum, will connect easily by just plugging the devices together. Such connections would be available on hinges that connect to door harnesses that carry power across the door to the locking device.

Cylinders

Cylinders are used on the exterior of exit devices to operate the trim. They can also be used to operate additional components of the device such as an alarm or the dogging feature if available. See Cylinders for Locking Devices in this chapter.

Dogging

Dogging a device means the device is operated to the open or unlocked position where all of the bolts are retracted and locked in that position.



FIGURE 2.69 Exit Device Auxiliary Control
(Source: Courtesy of Scott J. Tobias)



FIGURE 2.70 Cylinder Dogging Exit Device
(Source: Courtesy of SARGENT® Manufacturing Company)

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FIGURE 2.71 Hex Key for Dogging
(Source: Courtesy of SARGENT® Manufacturing Company)

The locking can be specified to either use a keyed cylinder or hex or Allen wrench key. Obviously, the keyed cylinder is the more controlled type of function so that only those who have access to the key can perform the function; otherwise, anyone with the right size Allen wrench can do the same.

Why would we want to dog open a device? Let's use a school as an example. When a typical school is opened for the day, if not dogged in the open position, the exit hardware would cycle over and over each time a student, teacher, or personnel opened the door and went through the opening, putting excess use on the device and shortening its life.

If the device is dogged in the open position in the morning by those responsible, the device acts as a push/pull device, and the use of the latches and springs during operation of the device is limited, saving it from unnecessary wear and tear, extending its life.

Consider the electronic dogging we discussed earlier; with the flip of a switch from a central location, we would save the time of a person or persons, who would otherwise have to go around the school perimeter to manually dog and undog these devices at the start and end of each day, not to mention possibly saving lives in an emergency lockdown situation.

Dummy Rail

A dummy rail is used for decorative purposes only and does not activate any latch or device. Be aware of egress code requirements, which might prohibit the use of a dummy bar on the egress side of an opening.

ACTIVE

Active dummy rails have an actuating bar that is not connected to anything and does not operate other than depressing and retracting from the housing.

INACTIVE

Inactive dummy rails do not have an actuating bar or any moving parts.

Electrical

Exit hardware is available with electrical options. These options can be used for a multitude of purposes, including having to tie into a fire alarm system so that it opens when there is an emergency and a firefighter can gain access without having to break through the door opening.

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Another reason for having an electrical function would be to tie into an alarm/security, or access control system. These systems would have the ability to monitor the latching and locking of the opening, and would signal the security station if they were not functioning as required. Access control would simply mean that one would be able to gain access through the opening by presenting proper electronic credentials to the opening, which would be confirmed by the system, allowing or denying access.

ALARM

An alarm option in an exit device is typically used to alarm a door that is not intended to be operated except in an emergency. The alarm is installed into the push rail, and when the actuator is depressed on the exit hardware, it engages an alarm, which can be a local alarm or remote to a central monitoring location.



FIGURE 2.72 Alarmed Exit Device
(Source: Courtesy of SARGENT® Manufacturing Company)

BATTERY

Some devices or components of a device, such as electronic trim, might operate on batteries if there is no hard-wired power source available to power the locking device or trim. Battery life on these types of devices has been optimized and gets better with new innovations. Some trim can last up to a year with indicator lights and or sounds that give you months of warning that the battery needs to be changed.

DELAYED EGRESS

Delayed egress devices are typically used to alarm a door similar to an alarm option, with the added feature of delaying the egress, or exit through the opening. There are certain codes and authorities having jurisdiction that do not allow delayed egress devices due to their interpretation of the device as being more harmful than helpful to people who use the opening.

If the device is allowed by code, there are typically requirements such as a maximum timed delay and notification by signage indicating length of delay. When codes do not allow a delayed egress function, an alarm option is typically used instead.

DOGGING

Electric dogging is an option that allows dogging of the device by the use of an electrical force rather than a mechanical method. Electric dogging can be accomplished by either physically depressing each push pad so that it is held open electrically or by adding the option of electric latch retraction, which would allow retraction of the latch remotely so it could be electrically dogged by computer or switch.

HARD-WIRED

Hard-wired devices have wires running directly into them from an outside power source. The outside power source can be a voltage source, such as 24 VAC, or a power over an Ethernet source through the computer cables that connect your network to the Internet.

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INTEGRATED WIEGAND

Panic and fire exit device trim is available with an integrated Wiegand card reader device. This reader is a proximity type, where the card is presented within proximity of the reader and is read by radio frequency rather than having to make the card physically contact the surface of the reader.

INTELLIGENCE

Exit devices can be equipped with intelligence, similar to that of your automobile. The newer the automobile, the more intelligent they become with what is called CAN bus technology. Have you ever noticed that, when you turn the key or push the ignition button, the lights flash and the horn beeps almost talking to each other? That is CAN bus—CAN, short for controller area network, is a standard that allows devices to communicate with each other without a host computer or software.

LATCHBOLT MONITORING

Latchbolt monitoring is an electrified option that allows the monitoring of the latchbolt position, whether extended or retracted. This allows the signaling of any devices that have not extended and secured into the strike so that this can be followed up with in person to rectify the situation.

LEVER MONITORING

Lever monitoring is an electrified option that allows the monitoring of the lever handle position, whether rotated or in the rest position. This allows the signaling of any lever handle that is in the rotated position, indicating that the latchbolt is likely retracted and not secure in the strike.

LATCH RETRACTION

Electric latch retraction allows the remote electronic retraction and extension of the exit hardware latchbolt. The operation can be accomplished by computer, a switch, or credentials such as a card and reader. When the signal is initiated, the latch of the device is retracted so that the door can be pulled or pushed open without having to retract the push pad from the inside or rotate a lever from the outside of an exit hardware device.

POWER OVER ETHERNET

Devices that are powered over Ethernet are energized by the Ethernet cable that hard-wires the computers to their network and the Internet, instead of having a separate voltage power source. The advantages of this network is low power consumption and that the network and door monitors are always live and talking to the system, ready to alert one of any suspicious activity.

REQUEST TO EXIT SWITCH

Request to exit switches are an electrified option available to shunt an alarm during an authorized exit. If a door has a local or remote alarmed exit hardware device, door and frame signal switch, lever, or latchbolt monitoring switch, a request to exit switch sends a signal to the contact, alarm, or computer stating that the doorway is being accessed from the exit side and that no credentials are required. This shunts the alarm, allowing the person to go through without having to present electronic credentials.

TRIM

Electrified trim is available on the outside of an exit device door so that a door can be accessed from the outside with the use of an electronic access control system. Typically rigid, when a switch such as a card reader authorizes the credentials presented to it, the trim unlocks and is able to be rotated to retract the latchbolt, pull the door forward, and gain entry to the space.

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FIGURE 2.73 Exit Device Electric Latch Retraction Diagram
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.74 Electrified Exit Device Trim
(Source: Courtesy of SARGENT® Manufacturing Company)

Fail Safe

Fail-safe door trim is available to tie into a fire alarm system. This trim only locks when power is applied to the opening and unlocks when power is released. This function uses power all of the time but is necessary to meet the codes in certain situations if electrification is necessary at the opening. The devices are manufactured differently, depending on the manufacturer and options, and can be operated by solenoid or a motorized mechanism, which would retract and throw the bolt accordingly, or simply allow the lever or knob to be rotated to retract the latch manually.

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FIGURE 2.75 Wayfinding Device
(Source: Courtesy of SARGENT® Manufacturing Company)

Fail Secure

Fail-secure door trim is available for locking and unlocking a device. This trim only unlocks when power is applied to the opening and locks when power is released. This device uses less power than fail safe trim, as the power is only used when necessary to open the device. The devices are manufactured differently, depending on the manufacturer and options, and can be operated by solenoid or a motorized mechanism, which would retract and throw the bolt accordingly, or simply allow the lever or knob to be rotated to retract the latch manually.

WAYFINDING

Flashing LED lights, a directional green laser, and an audio alarm that states "Exit This Way" are some of the features of wayfinding. With sensors to detect and shunt the wayfinding features if the fire is too hot on the other side of the door, these devices typically guide you to a nearby exit when the fire alarm system is activated.

WIRELESS

In addition to the common household wireless fidelity (WiFi) that we all know and use for our wireless Internet access with the use of a wireless router connected to the modem, there are other wireless technologies available and incorporated into many existing mechanics, including electronic door locksets. Some of these low-power-consumption wireless technologies send wireless signals to local hubs separate from the 802.11 routers that we are used to in our homes.

WIRELESS FIDELITY

Devices that have WiFi technology are typically powered by battery. These devices communicate on the same 802.11 wireless networks that we use to transmit our Internet signal from the hard-wired modem into the air so that our computers and mobile devices can connect and use the signal to do various things—most commonly access the Internet. New devices that incorporate both the modem and router are available by some Internet access providers.

The WiFi sends and receives data from the computers and system. The advantages of this network is low power battery consumption and easy network installation and communication, especially for existing conditions where running hard wires is not efficient or sometimes even possible due to wall and frame materials. Although the system is not live all of the time, the network and door monitors "wake up" and talk to the system whenever there is any suspicious activity.

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Fire Rating

Fire exit hardware devices are tested to meet fire standards and codes, allowing it to be installed and operated on fie rated door openings. Panic hardware is not necessarily tested and rated to meet fire standards and codes.

Functions

Depending on the manufacturer and reentry application, there are many functions available to operate the outside trim of panic and fire exit hardware. Functions range from simple mechanical passage and keyed locking to more technical options such as electronic locking and monitoring functions.

There are some more commonly used functions such as passage, privacy office, classroom, and storage. Although these functions are used the majority of the time, depending on the manufacturer's product

TABLE 3
EXIT DEVICE FUNCTION

BHMA NUMBER	FUNCTION DESCRIPTION
01	EXIT ONLY, NO TRIM.
02	ENTRANCE BY TRIM WHEN ACTUATING BAR IS LOCKED DOWN.
03	ENTRANCE BY TRIM WHEN LATCHBOLT IS RETRACTED BY KEY. KEY REMOVABLE ONLY WHEN LOCKED.
04	ENTRANCE BY TRIM WHEN LATCHBOLT IS RETRACTED BY KEY OR SET IN A RETRACTED POSITION BY KEY.
05	ENTRANCE BY THUMB PIECE. KEY LOCKS OR UNLOCKS THUMB PIECE.
06	ENTRANCE BY THUMB PIECE ONLY WHEN RELEASED BY KEY. KEY REMOVABLE ONLY WHEN LOCKED.
07	ENTRANCE BY THUMB PIECE. INSIDE KEY LOCKS OR UNLOCKS THUMB PIECE. OUTSIDE KEY RETRACTS LATCH.
08	ENTRANCE BY KNOB OR LEVER. KEY LOCKS OR UNLOCKS KNOB OR LEVER.
09	ENTRANCE BY KNOB OR LEVER ONLY WHEN RELEASED BY KEY. KEY REMOVABLE ONLY WHEN LOCKED.
10	ENTRANCE BY KNOB OR LEVER. INSIDE KEY LOCKS OR UNLOCKS KNOB OR LEVER. OUTSIDE KEY RETRACTS LATCH.
11	ENTRANCE BY CONTROL TURN PIECE. KEY LOCKS OR UNLOCKS CONTROL.
12	ENTRANCE BY CONTROL TURN PIECE ONLY WHEN RELEASED BY TURNING KEY. KEY REMOVABLE ONLY WHEN LOCKED.
13	ENTRANCE BY KEY OR COMBINATION LOCK.

FIGURE 2.76 Exit Device Function Chart
(SOURCE: THE Graphic Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)



FIGURE 2.77 Security Classroom Exit Device with Thumb Turn
(Source: Courtesy of SARGENT® Manufacturing Company)

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availability, there are many other specialty functions to choose from such as hotel, dormitory, and automatic deadbolt lock. Figure 2.76 is the chart as listed in ANSI/BHMA A156.13 American National Standard for Mortise Locksets and Latches Series 1000, 2005

Handing

As described in the Introduction, there are several ways to hand doors, frames, and hardware. Panic and exit hardware is always a reverse bevel handing, either left-hand reverse (LHR) or right-hand reverse (RHR). This is true because all handing is done from the secure or keyed side of the door and with panic and fire exit hardware always on the push side of the door and free to exit; the secure side is always the pull side of the door. If you are dealing with a passage function and there is no real secure side of the door in the locking sense, hand the door logistically as if there were an outside and inside, where the inside would have any visible mounting hardware such as screw heads.

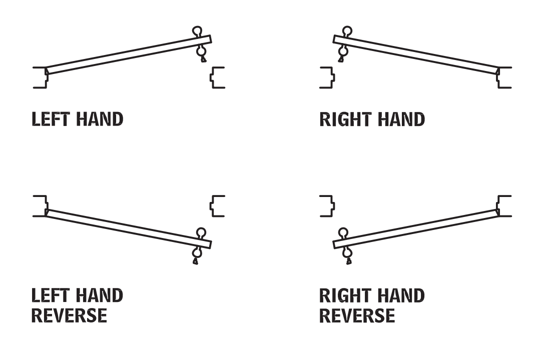


FIGURE 2.78 Door-Handing Chart

(Source: The Graphic Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)

Latching

Latching is a function of the panic or exit device latchbolt, where it engages into the respective strike on the door frame. Depending on the device type, there are different latching options available.

CENTER

Center latching is typical on a single door with a rim or mortise panic or fire exit device. The latch is approximately in the center of the height of the opening at the latch edge of the door and, depending on the door type, anywhere from 38 inches to 40 5/16 inches above the finished floor.

CENTER AND TOP

Center and top latching is typical on one leaf of a pair of doors with concealed vertical rod panic or fire exit devices. There cannot be a top and center latching device on both leaves of a pair of doors. The latches at the center would hit each other and create a conflict with no strike for either to latch into; one leaf would have to have a device with just top latching. The center latch is approximately in the center of the height of the opening at the latch edge of the door and, depending on the door type, is anywhere from 38 inches to 40 5/16 inches above the finished floor and the top latch is at the top corner or the latch edge of a door.

TOP

Top latching is typical on both leaves of a pair of doors with concealed or surface-mounted vertical rod panic or fire exit devices. The top latch is at the top corner or the latch edge of a door.

TOP AND BOTTOM

Top and bottom latching is typical on both leaves of a pair of doors with concealed vertical rod panic or fire exit devices. The latches are at the top and bottom corners of the latch edge of a door.

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Although surface-mounted top and bottom vertical rod devices are available, accessibility codes and standards do not allow their use. The code roughly states that no projections are allowed off of the lower face of the door at certain heights, depending on the code or standard.

TOP, CENTER, AND BOTTOM

Top, center, and bottom latching is typical on one leaf of a pair of doors or a single door, possibly rated for hurricanes or tornados, with concealed vertical rod panic or fire exit devices. There cannot be center latching devices on both leaves of a pair of doors as the latches at the center would hit each other and create a conflict with no strike for either to latch into; one leaf would have to have a device with just top and or top and bottom latching.

The center latch is approximately in the center of the height of the opening at the latch edge of the door, and, depending on the door type, is anywhere from 38 inches to 40 5/16 inches above the finished floor and the top latch is at the top corner or the latch edge of a door.

Although surface-mounted center, top, and bottom vertical rod devices are available, accessibility codes and standards do not allow their use. The code roughly states that no projections are allowed off the lower face of the door at certain heights, depending on the code or standard.

Luminous

Although using luminous materials was minimal and voluntary several years ago, there are some manufacturers that have fabricated these materials into their devices and are now prepared to make them standard as they become requirements. Those using devices without the luminous option would have to apply the luminous materials to the device—either as a sticker or paint—both of which are insubstantial and unreliable materials for the application.

Codes such as the International Building Code (IBC) are becoming more detailed with the requirements for luminous materials on panic and fire exit hardware on certain openings. Section 1024 of the IBC states, "Where a panic bar is installed, such material shall be no less than 1 inch (25 mm) wide for the entire length of the actuating bar or touchpad."

ELECTRO

Electro-luminous material is a high-intensity light source that emits through fire and smoke. This light source requires power and would have to be tied into a backup generator source to operate. Although it is not part of the codes or standards that the luminous material be electro, there are manufacturers that have this type of panic and fire exit device available.



FIGURE 2.79 Electro-Luminous Device
(Source: Courtesy of SARGENT® Manufacturing Company)

PHOTO

Photo-luminous material is a glow-in-the-dark light source that emits through fire and smoke. This light source does not require power other than a separate light source shining on it to keep it charged. The codes and standards are typically met with this type of luminous material and there are manufacturers that have this type of panic and fire exit device available.

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FIGURE 2.80 Photo-Luminous Device
(Source: Courtesy of SARGENT® Manufacturing Company)

Narrow Stile

Narrow stile panic and fire exit devices are basically the same as standard stile panic and fire exit devices, except the chassis at the latch edge of the door has a narrower profile. This would be installed on doors that have a narrow stile, where the chassis of a standard device will not fit.

Security Shim Kit

When installed on full glass stile and rail doors, conventional panic and fire exit hardware creates a void between the back of the device and the glass. This is an unsafe situation where something like an article of clothing could get caught while in the path of egress. A shim kit fills the void and creates a solid con-



FIGURE 2.81 Narrow Rim-Mounted Exit Device
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.82 Security Shim Kit Not Installed
(Source: Courtesy of SARGENT® Manufacturing Company)

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FIGURE 2.83 Security Shim Kit Installed
(Source: Courtesy of SARGENT® Manufacturing Company)

tact to the glass with no place for something to get caught, which might slow or prevent someone from making their egress through the door opening most efficiently.

Touch Sense Bar

A touch sense bar is a dummy rail of sorts, except it is a switch that operates with the heat from your hands. Nothing typically is depressed, but the bar senses your hand's touch and sends a signal to release the hardware, say, an electromagnet. Although the movement does nothing, there are manufacturers that offer touch sense bars that do depress for a more realistic exit hardware feel while exiting the door.

Similar to the tube mechanical exit hardware, there are touch sense tube panic hardware devices available that release an electrical component such as an electromagnet, when the hand is sensed on the push rail.

Trim

Trim, also referred to as knobs, lever handles, or pulls, are available in many options and designs, depending on the manufacturer. The lever, knob, and pull designs are typically mounted on an escutcheon, which is a rectangular plate behind the lever or knob. This serves as a decorative plate, but conventionally also hides the fasteners behind the plate that are necessary to secure the device to the door.

ANTI-VANDAL TRIM

Anti-vandal trim is an available option for lever handle trim that takes the pressure off of the lever handle. When an amount of pressure predetermined when the device is manufactured is applied to a rigid or locked lever handle, the lever drops and separates itself from the stem so that the spindle and internal parts of the exit device do not get damaged. The lever can be reset by lifting it back in place, where the lever will operate the latch as required.

Knob

Originally designed to grasp and rotate in order to retract a latch and open a door, knob trim was replaced for the most part by lever trim when the Americans with Disabilities Act was introduced in 1992. Knobs require a tight grasp and twist motion to operate a door, which is strictly prohibited by most building, life safety, and disability codes and standards.

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FIGURE 2.84 Lever Handle
(Source: Courtesy of SARGENT® Manufacturing Company)

Lever

Designed in the shape of a lever handle, these devices have met some of the guidelines and give the opening a more conventional aesthetic than that of solely a healthcare facility. Some manufacturers have more options and have enhanced on the operation, guideline standards, and aesthetics of the device.

DECORATIVE

Trim can also be an aesthetic component of the panic or fire exit hardware outside trim. Some manufacturers offer many lever handle design choices for all hardware types; some have suites that allow consistent design on all hardware types including panic and fire exit hardware. Other matching lever types include mortise locksets, electronic access control locksets, and tubular passage, privacy, and dummy trim. There are also suites of hardware available that include lever handles for locksets, pull handles for glass and sliding doors, drawer pulls, door stops, coat hooks, and hinges. With coordination, this would give the entire opening, interior, and building a consistent door opening design.

ELECTRIFIED

Electrified trim is available on the outside of an exit device door so that a door can be accessed from the outside with the use of an electronic access control system. Typically rigid, when a switch such as

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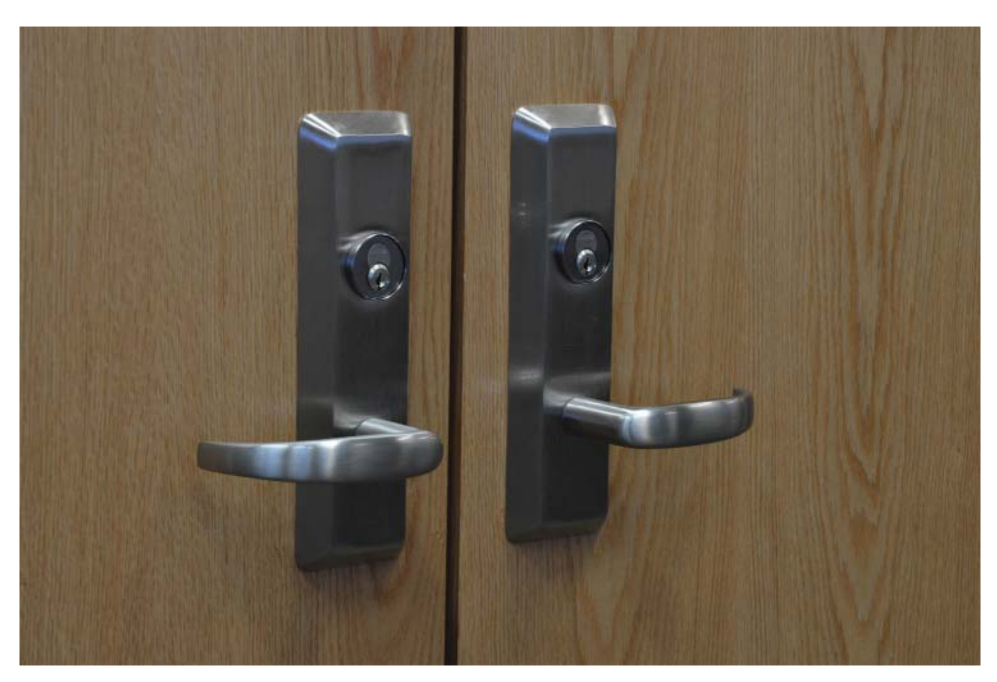


FIGURE 2.85 Exit Device Escutcheons with Decorative Lever Handles
(Source: Courtesy of SARGENT® Manufacturing Company)

a card reader authorizes the credentials presented to it, the trim unlocks and is able to be rotated to retract the latchbolt, allowing the door to be pulled open for entry to the space. Other available trim options include fail-safe or fail-secure function, voltage required, latch monitoring, lever monitoring, latch retraction, and request to exit. See Options/Electrified in this section.

ESCUTCHEON

An escutcheon is a backplate to the trim, and if there is one, it is a cylinder on the outside and thumb-turn on the inside of the door. Escutcheons can be rectangular, oval, or custom in shape as well as flush, with pattern, or framed edges.

HAZARD OR TACTILE WARNING

Some standards and codes require that knobs and lever handles have a hazard warning signal for those who have vision impairment. Manufacturers offer very limited choices to meet the hazard warning requirements, as follows:

Abrasive Coating

An abrasive coating is a nonsticky, black tar–like material with gravel-type material mixed into it. The material is a thick liquid that, when applied, and coats the entire knob or lever handle, except for the cylinder opening. When dry, the trim has a rough, black tar–like coating and finish.

Knurled

A knurled handle has patterns of scored on it and metal removed from the surface of the knob or lever handle. These "bumps" are typically on the back side of the knob or handle where the fingers would feel the coarse, uneven surface and markings on the trim.

HEAVY DUTY

Heavy-duty trim is available for very frequently used door openings that might need to withstand high-abuse situations. This trim is typically very strong and will outlast conventional-duty trim.

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FIGURE 2.86 Heavy Duty Exit Device Escutcheon with Lever Handle
(Source: Courtesy of SARGENT® Manufacturing Company)

KNOB

Knob trim is available for the outside operation of panic and fire exit hardware. Typical knobs are round, although some custom knobs might be more oval or square. In 1992, lever handles became the new standard as knobs no longer met the requirements or complied with the ADA.

LEVER

Lever trim is available for the outside operation of panic and fire exit hardware. Typically elongated and placed horizontally across the door face at the door lock edge, lever handles have many designs and choices in aesthetics. Some manufacturers offer lever trim designs for their panic and fire exit hardware consistent with their other locking device offerings, such as mortise locksets or electronic access control locking hardware.

Lever handle trim became the new standard in 1992 to meet the new ADA standard and requirements. These and current requirements roughly state that doorways cannot be operated by a twisting or pinching motion, which is how a conventional doorknob is operated. With a lever trim, you can lean on the lever and still retract the latch to operate the door.

Certain codes require that the lever have a return to the door at its end, with no more than ½-inch clearance between the end of the return and the door face. This is to prevent anything from getting caught behind the lever handle, such as clothing or a fire hose prior to being filled with water.

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FIGURE 2.87 Exit Device Lever Trim with Escutcheon and Cylinder
(Source: Courtesy of SARGENT® Manufacturing Company)

PULL

Pull trim is a good option for panic and fire exit hardware for heavy-duty applications. The pull is typically rigid, although some have thumb pieces and or cylinders to retract the latch, and are ideal for use where the device might be dogged for long periods of time.

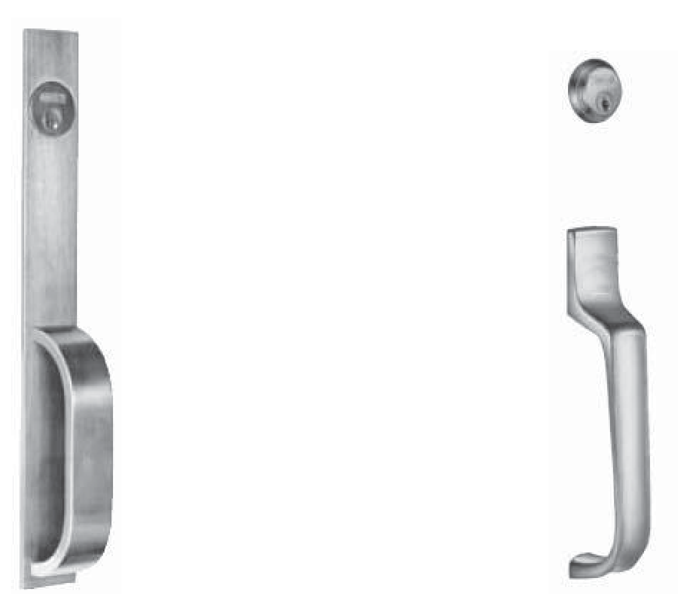


FIGURE 2.88 Exit Device Pull Trim
(Source: Courtesy of SARGENT® Manufacturing Company)

FIGURE 2.89 Exit Device Pull Trim
(Source: Courtesy of SARGENT® Manufacturing Company)

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RIGID

Rigid trim is trim that does not move and is always fixed in one position. Examples of rigid trim are pull handles and dummy trim.

ROSETTE

Most exit devices are not available with a rosette option, which is a backplate to the outside trim due to the mounting plates and screws that are required to mount the exit device on the opposite side of the door. The escutcheon is more likely used, which will also be used to cover all mounting plates and screws.

Windstorm Ratings

Some manufacturers offer Federal Emergency Management Agency (FEMA) and ICC/NSSA International Code Council/National Storm Shelter Association exit hardware device ratings to meet hurricane and tornado safety standards. These standards require the door, frame, and hardware to be heavy-duty and reinforced assembly tested as is, including the installation of the frame to the surrounding wall.

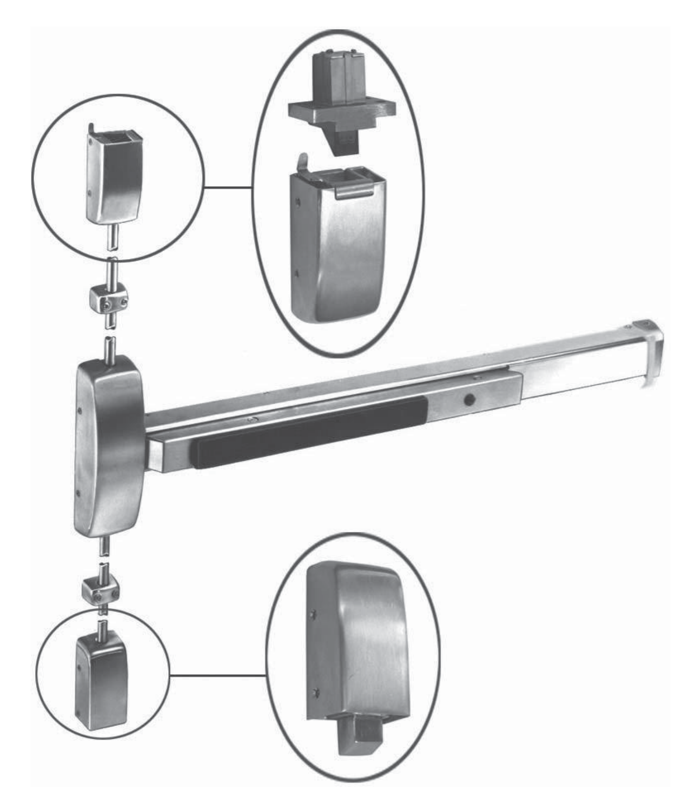


FIGURE 2.90 Windstorm Rated Surface Vertical Rod Exit Device and Latches
(Source: Courtesy of SARGENT® Manufacturing Company)

QUANTITIES

Panic and fire exit hardware devices are applied in single quantities per door leaf. A single door would operate with one device, while a pair of doors might operate with two devices, although it might operate with one device along with another hardware type such as flushbolts.

APPLICATIONS

Although most of the device applications have similar options, they are installed onto or into the door very differently.

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Concealed

Concealed devices are installed inside of the door except for the operating components that need to be visible for operation. Most commonly known is the concealed vertical rod exit device, where the device and chassis are visible on the surface or face of the door, but the rods and latches that the rods operate are all concealed in the edge of the door.

Integrated door opening assembly panic or fire exit hardware devices are also typically concealed inside of the door, including not only the rods and latches, but also the chassis.

Mortise

Mortise applications require the mortise lock, which is the locking device for mortise lock panic or fire exit hardware, to be mortised into a pocket at the lock edge of the door. Depending on the lockset function, cylinder and or lever handle holes will need to be made on the face of the door for operation of the same.

Surface Mounted

Surface-mounted devices are typically one of two types, a rim device or surface-mounted vertical rod panic or fire exit device. These devices are fully surface mounted on the face of the door except for any function holes necessary for cylinders, trim, and the latch strikes on the frame.

Tube

Some manufacturers offer a tube design panic hardware. These devices are typically intended for full glass doors where there is no conventional frame for the strikes to latch into or door body for the hardware to be installed onto or into. These devices are aesthetically pleasing to many but might not have the functionality or ratings, both fire and life safety, necessary for every application.

INSTALLATION

Panic and fire exit hardware are typically installed either fully or partially on the face of the door. Some devices are partially concealed, and some operate fully concealed inside the door. They all latch in some way into the frame, either the side, top, both side and top, or in some cases the bottom alone or along with other sides of the frame. All of the latch combinations extend into a strike on the frame at the same location as the door.

If a panic or fire exit device is being installed on a stile and rail door, always confirm the lock stile dimension to ensure that the device will have enough room to be installed.

Fasteners

Panic and fire exit hardware are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat-head screws are available depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Panic and fire exit hardware should be installed at locations as recommended by industry standards and codes, which are typically measured from the finished floor. Depending on the door and frame type,

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whether considered standard or custom metal, wood or aluminum, standards recommend starting the first hinge from the finished floor.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the centerline of the strike for side-latching devices on the frame installed at 40 5/16 inches.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have the centerline of the strike for side-latching devices on the frame installed at 38 inches.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors are recommended to have the centerline of the strike for side-latching devices on the frame installed at 40 5/16 inches.

Preparations

Panic and fire exit hardware device preparations are typically machined at the factory, including drilling and tapping screw holes. With metal doors and frames, the preparations are most typically reinforcements for the rail and chassis. Additional reinforcements as recommended by the manufacturer might include cutouts or reinforcements for surface or concealed mounted vertical rod exit devices, including the channels for the concealed rods.

REMOVABLE MULLIONS

Also Known As: Center Mullion, Door Mullion

DESCRIPTION

A mullion, when referring to a door frame, runs down the center of a pair of doors and can be manufactured as part of the frame so that each door can latch and operate independently. If both of the doors in a pair are required to be active for egress or any other purpose, this application is another option to using vertical rod exit devices on a pair of doors or a lockset with automatic flushbolts.

Another option to manufacturing the mullion as part of a frame would be a hardware component known as a removable mullion.

PROPERTIES

A removable mullion is a single piece of material, which is typically metal in commercial construction, and is also typically the same height as the doors with which it will be installed.

Finishes

Removable mullion finishes are limited and typically available in light and dark anodized aluminum finishes or a prime coat of paint to be painted over in the field with a finish paint or coating.

Materials

Removable mullions are typically available in aluminum, steel, and wood materials.

Shapes

Removable mullions are available in limited shapes, which are optimal for installing in between two doors so that they become independent of each other and can latch or lock into the mullion.

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RECTANGULAR

Removable mullions are available in a rectangular shape with various dimensions, depending on the manufacturer.

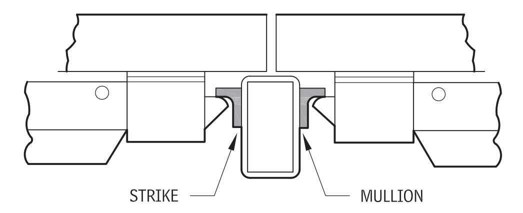


FIGURE 2.91 Rectangular Removable Mullion
(Source: Courtesy of SARGENT® Manufacturing Company)

TEE SHAPE

Removable mullions are available in a tee shape, where the top or horizontal part of the tee is the stop against which the door stops, and the vertical portion is where the door latches or locks into the mullion.

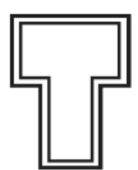


FIGURE 2.92 Tee Shape Removable Mullion
(Source: Courtesy of SARGENT® Manufacturing Company)

Sizes

Removable mullions are available in standard door height sizes and custom sizes, depending on the manufacturer's availability as well as industry standards for proper and consistent operation. There might be a premium cost for any custom size requests. Some manufacturers offer a standard size of 96 inches, which can be cut down in the field to match the usable door height.

TYPES

Technically, there is only one type of removable mullion, with varying properties and options.

OPTIONS

Electric Transfer

Removable mullions are available with wires running through them so that electrified hardware can be connected such as an electric strike. The wires run from the ceiling down the center of the mullion to the electric device on the frame in order to power the device.

Fire Rated

Some removable mullions have been fire tested and comply with fire rated codes and standards.

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Windstorm Rated

Some removable mullions have been tested and comply with severe wind conditions due to hurricanes and tornadoes. These mullions are typically furnished as part of a total door assembly, which includes doors, frames, and hardware that are tested as an assembly and not components.

Lockable

Keyed removable mullions are secured with a cylinder and key, this way only those authorized and with a physical key are able to unlock and remove the mullion. A storage closet or entrance to a room that might have furniture, equipment, or even art in an art gallery might need the doorway to become wider from time to time, and when not in use for that purpose, a locking mullion would help secure the opening.



FIGURE 2.93 Lockable Removable Mullion
(Source: Courtesy of Scott J. Tobias)

Nonlockable

Nonkeyed removable mullions are able to be removed by releasing a latch or might be secured in place with a fastener. This would be used when the door opening is not a secure space or an area where it is certain that the mullion would not be tampered with. Otherwise, the mullion could be removed from the opening very easily.

QUANTITIES

Removable mullions are installed on one per pair of doors in the center of the doors. This allows the devices, whether a lockset or exit device, to have something to lock into, while allowing the doors to remain independent of each other. This means that one door does not rely on the other for proper operation and, in theory, each door operates as a single unit within the pair opening.

APPLICATIONS

A removable mullion might be specified and installed for increased security as a preference to using vertical rod exit devices, or both. By providing the additional framing or hardware as removable, a different type of locking hardware can be installed, such as a lockset or rim exit device, which is typically more secure (and aesthetically pleasing to some) than vertical rod exit devices.

Without the mullion in place, the latches of a conventional lockset or rim exit device would have nothing to secure into, and the latches of each door would conflict and hit each other, instead of engaging into a strike as necessary.

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INSTALLATION

Removable mullions are installed in between a pair of doors to allow each door to operate and latch or lock independently of each other into the mullion.

Fasteners

Removable mullions are typically installed with screw fasteners, which are available for wood or metal installation. Phillips and flat head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Various kits and brackets are available for various field conditions, such as narrow transom brackets and shims for leveling the mullion when installing. Also available are mounting retainers, which help align and stand the mullions plumb and flush as required.

Locations

Mullions are installed in between a pair of doors with fasteners at the top and bottom of the mullion to secure it in place.

Preparations

Removable mullions do not typically come prepared for hardware and is typically prepped in the field by the installer.

The screw holes are prepared and if using a mounting kit, they are also prepared for the required fasteners.

TWO- OR THREE-POINT LOCKSETS

Also Known As: Multipoint Locking Device

DESCRIPTION

Two- and three-point locksets provide multiple points of contact for bolts of a lockset in lieu of the conventional exit device. Conventional devices have a single point, such as a rim exit device, or two points, such as a concealed vertical rod exit device, which are most commonly used. These devices might more commonly be used in a more high-security area or an area tested for hurricane or tornado activity.

PROPERTIES

Two- or three-point locksets can be manufactured with various configurations, aesthetics, functions, and options.

Actuating Bar

Two- and three-point locksets might act as panic and fire exit hardware and have similar actuating bars, which are depressed to retract the latches of the device, allowing egress.

CROSSBAR

The crossbar actuator is the original panic and fire exit hardware design, which looks like a tubular bar installed horizontally across the face of the door. The crossbar can be depressed fully to retract the latchbolts, allowing the door to be pushed open.

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FIGURE 2.94 Crossbar Device
(Source: Courtesy of SARGENT® Manufacturing Company)

Although aesthetically pleasing, crossbars can present issues, as some building occupants (or even staff) will chain them together for security purposes. This is obviously not allowed by code, especially in the means of egress.

TOUCHPAD

The touchpad actuator is the newer of the designs available and looks like a rectangular pad installed horizontally across the face of the door. At least half of the touchpad depresses (required by code) when pushed to retract the latchbolts, allowing the door to be pushed open. This design is more likely to be available over the crossbar for hurricane and tornado ratings.

Chassis

The chassis is where the latchbolt is housed, and it is operated by the actuator. Depending on how the device is manufactured, the chassis can be engaged by the actuator from its side or face. The chassis is usually protected by a cover, which is typically made with the same architectural finish as the rest of the device and door hardware specified.



FIGURE 2.95 Touchpad Device
(Source: Courtesy of SARGENT® Manufacturing Company)

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Finishes

Visible parts of an exit device are available in most architectural finishes, depending on the manufacturer and their available selections.

Grade

Two- and three-point locksets are available in different grades known as grade 1, grade 2, and grade 3 with grade 1 being the best and highest grade. Aside from the grades, other ratings such as windstorm for hurricane or no ratings for residential use might be available.

Materials

Two- and three-point lockset parts, including internal working parts, actuating bars, chassis, trim, rods, and strikes, can be manufactured from brass, bronze, stainless steel, or steel, depending on the manufacturer and device.

Strikes

Strikes are the keeper for latches of two- and three-point lockset hardware. Depending on the device and latch type, there are strikes available to suit each, which are typically furnished with the device along with fasteners and other required parts.

TYPES

Two Point

CONCEALED VERTICAL TOP AND BOTTOM RODS

Typically manufactured as a panic or fire exit hardware device, two-point locksets are available as concealed vertical rods with a push rail on the egress side with two latches, one at the side and one at the top, one at the top and bottom, or one at the side and one at the bottom. Concealed rods are similar to surface ones, except the rods are hidden inside of the door opening. This helps with the aesthetics for those who do not find surface-mounted rods appealing. However, like surface-mounted rods, this hardware can be a maintenance nightmare because adjustment typically cannot be completed while the door is hanging in the opening. The door will have to be taken down from its hanging device; the latches will have to be adjusted regularly, depending on the frequency of use, and the door rehung accordingly.

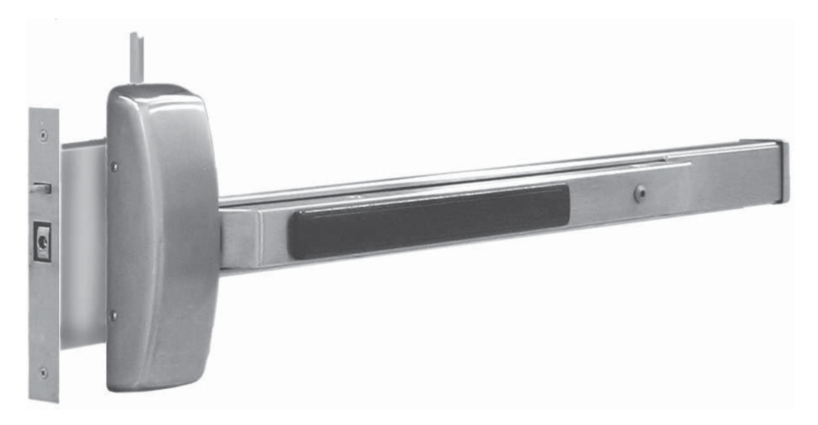


FIGURE 2.96 Concealed Two-Point Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)

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Since the latch adjustments cannot be tested while the door is out of the opening, if they are not sufficient, the door will have to be taken down again, and the cycle will continue until the adjustments are correct, which can waste a lot of resources and labor.

Two-point concealed vertical top and bottom rod devices are also available with lever handles on both sides of the door, operated by either a bored or a mortise lockset device installed on the latch side of the door.

RIM

Typically manufactured as a panic or fire exit hardware device, rim two-point locksets are available with a push rail on the egress side with two latches. The rim latch is located at the latch side of the door and frame and the second latch is on either the top or bottom of the door, more likely at the top.

MORTISE

Typically manufactured as a panic or fire exit hardware device, mortise two-point locksets are available with a push rail on the egress side with two latches. One type has the latch at the side of the door and frame on the latch side of the door and at either the top or bottom of the door, and the other type has one at the top and bottom with no latch on the side.

SURFACE TWO POINT

Typically manufactured as a panic or fire exit hardware device, surface vertical rod two-point devices were originally offered as top and bottom, with the rods extending from the cross- or touch bar at the center of the door, extending the entire height of the door opening, and latching into strikes at the head of the frame and floor.

Two-point surface vertical top and bottom rod devices are also available with lever handles on both sides of the door, operated by either a bored or a mortise lockset device installed on the latch side of the door.



FIGURE 2.97 Surface Two-Point Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)

Three Point

CONCEALED VERTICAL TOP AND BOTTOM RODS

Typically manufactured as a panic or fire exit hardware device, three-point locksets are available as concealed vertical rods with a push rail on the egress side with three latches, one at the side, one at the top, and one at the bottom. Concealed rods are similar to surface ones, except the rods are hidden inside of the door opening. This helps with the aesthetics for those who do not find surface-mounted rods appealing. However, like surface-mounted rods, this hardware can be a maintenance nightmare, because the adjustment typically cannot be completed while the door is hanging in the opening. The

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door will have to be taken down from its hanging device; the latches will have to be adjusted regularly, depending on the frequency of use, and the door rehung accordingly.

Since the latch adjustments cannot be tested while the door is out of the opening, if they are not sufficient, the door will have to be taken down again, and the cycle will continue until the adjustments are correct, which can waste a lot of resources and labor.

Concealed vertical top and bottom rod devices are also available with lever handles on both sides of the door, operated by either a bored or mortise lockset device installed on the latch side of the door.

RIM

Typically manufactured as a panic or fire exit hardware device, rim three-point locksets are available with a push rail on the egress side with three latches. The rim latch is located at the latch side of the door and frame and the second and third latches at the top and bottom of the door.

MORTISE

Typically manufactured as a panic or fire exit hardware device, mortise three-point locksets are available with a push rail on the egress side with three latches. One type has the latch at the side of the door and frame on the latch side of the door and at either the top or bottom of the door, and the other type has one at the top and bottom in addition to the mortise latch on the side.

SURFACE VERTICAL TOP AND BOTTOM RODS

Typically manufactured as a panic or fire exit hardware device, surface vertical rod three-point locksets were originally offered as top and bottom, with the rods extending from the cross or touch bar at the center of the door, extending the entire height of the door opening, and latching into strikes at the head of the frame and floor in addition to the side.

Surface vertical top and bottom rod devices are also available with lever handles on both sides of the door, either operated by a bored or a mortise lockset device installed on the latch side of the door.

OPTIONS

Anti-Microbial Coating

Two- or three-point locksets are available with an optional anti-microbial coating. The coating is a silver ion–based clear coating that helps stop the spread of bacteria. Although there are silver ions, they are not visible to the eye and a brass or bronze finish shows its true color through the coating. Silver has been used throughout history to help reduce the spread of bacteria and infection: Why not put it on doors and hardware that are touched over and over again by numerous different people in a day?

Auxiliary Control

An auxiliary control is an option to lock and unlock the door from the outside, or pull side of the door, with a key and thumb turn where there are no lever handles or pulls but access might be required or desired. The cylinder unlocks the thumb turn and allows the rotation of the thumb, which retracts the latches of the exit device. This type of device might be questioned for ADA compliance.

Connectors

Electronic hardware has historically been connected by twisting together wires, but now there are plastic connectors that are prewired by the manufacturer so that their hardware will connect easily by plugging the devices together. Such connections are available on hinges that connect to door harnesses that carry power across the door to the locking device.

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Cylinders

Cylinders are used to operate the outside trim of the device. Please see Cylinders for Locking Devices in this chapter.

Dogging

Dogging a device means the device is operated to the open or unlocked position, where all of the bolts are retracted and locked in that position.

The locking can be specified to use either a keyed cylinder or hex or Allen wrench key. Obviously, the keyed cylinder is the more controlled type of function so that only those who have access to the key can perform the function; otherwise, anyone with the right size Allen wrench can do the same.

Why would we want to dog open a device? Let's use a school as an example. When a typical school is opened for the day, if not dogged in the open position, the two- or three-point lockset would cycle over and over each time a student, teacher, or other personnel opened the door and went through the opening, putting excess wear on the device and shortening its life cycle.

If the two- or three-point lockset is dogged in the open position in the morning by those responsible, the device acts as a push/pull device, and the latches, springs, and operation of the device are limited, saving the components from unnecessary wear and tear, extending the life cycle of the two- or three-point lockset.

Consider the electronic dogging we discussed earlier; with the flip of a switch from a central location we would save the time of a person or persons who otherwise have to go around the school perimeter to manually dog and undog these devices at the start and end of each day, not to mention possibly saving lives in an emergency lockdown situation.

Electrical

Depending on the manufacturer, two- or three-point locksets are available with electrical options. These options can be used for a multitude of purposes, including tying into a fire alarm system so that the lockset opens when there is an emergency and a firefighter can gain access without having to break through the door opening.

Another reason for having an electrical function is to tie into an alarm/security or access control system. These systems have the ability to monitor the latching and locking of the opening, and can signal the security station if this is not functioning as required. Access control simply means that one gains access through the opening by presenting proper electronic credentials to the opening, which are confirmed by the system.

DOGGING

Electric dogging is an option that allows dogging of the device by the use of an electrical force rather than a mechanical one. Electric dogging can be accomplished by either physically depressing each push pad so that it is held open electrically or by adding the option of electric latch retraction, which allows retraction of the latch remotely to be electrically dogged by computer or a switch.

HARD WIRED

Hard-wired devices have wires running directly into them from an outside power source. The outside power source can be a voltage source, such as 24 VAC, or a power over Ethernet source through your computer cables that connect your network to the Internet.

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INTEGRATED WIEGAND

Two- and three-point lockset trim is available with an integrated Wiegand card reader device. This reader is proximity-type, where the card is presented within proximity of the reader and is read by radio frequency rather than having to make the card physically contact the surface of the reader.

LATCHBOLT MONITORING

Latchbolt monitoring is an electrified option that allows the monitoring of the latchbolt position, whether extended or retracted. This allows the signaling of any devices that have not extended and secured into the strike so that it can be followed up with in person to rectify the situation.

LEVER MONITORING

Lever monitoring is an electrified option that allows the monitoring of the lever handle position, whether rotated or in the rest position. This allows the signaling of any lever handle that is in the rotated position, indicating that the latchbolt is likely retracted and not secure in the strike.

LATCH RETRACTION

Electric latch retraction allows the remote electronic retraction and extension of the hardware latchbolt. The operation can be accomplished by computer, a switch, or electronic credentials such as a card reader. When the signal is initiated, the latch of the device is retracted so that the door can be pulled or pushed open without having to retract the push pad from the inside or rotate a lever from the outside of a device.

REQUEST TO EXIT SWITCH

Request to exit switches are an electrified option available to shunt an alarm during an authorized exit. If a door has a local or remote alarmed exit hardware device, door and frame signal switch, lever or latchbolt monitoring switch, a request to exit switch sends a signal to the contact, alarm, or computer stating that the doorway is being accessed from the exit side and that no credentials are required. This shunts the alarm, allowing the person to go through without having to present electronic credentials.

TRIM

Electrified trim is available on the outside of an exit device door so that a door can be accessed from the outside with the use of an electronic access control system. Typically rigid, when a switch such as a card reader authorizes the credentials presented to it, the trim unlocks and is able to be rotated to retract the latchbolt, pull the door forward, and gain entry to the space.

Fail Safe

Fail-safe door trim is available to tie into a fire alarm system. This trim only locks when power is applied to the opening and unlocks when power is released. This function uses power all of the time, but is necessary to meet the codes in certain situations if electrification is necessary at the opening. The devices are manufactured differently, depending on the manufacturer and options, and can be operated by solenoid or a motorized mechanism, which would retract and throw the bolt accordingly, or simply allow the lever or knob to be rotated to retract the latch manually.

Fail Secure

Fail-secure door trim is available for locking and unlocking a device. This trim only unlocks when power is applied to the opening and locks when power is released. This device uses less power than fail safe, as the power is only used when necessary to open the device. The devices are manufactured differently, depending on the manufacturer and options, and can be operated by solenoid or a motorized mechanism, which would retract and throw the bolt accordingly, or simply allow the lever or knob to be rotated to retract the latch manually.

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Fire Rating

Fire two- and three-point lockset hardware devices are tested to meet fire standards and codes, allowing them to be installed and operated on fire rated door openings. Panic hardware is not necessarily tested and rated to meet fire standards and codes.

Functions

Depending on the manufacturer and reentry application, there are many functions available to operate two- and three-point lockset hardware. Functions range from simple mechanical passage and keyed locking to more technical options such as electronic locking and monitoring functions.

There are some more commonly used functions such as passage, privacy office, classroom, and storage. Although these functions are used the majority of the time, depending on what is available from the manufacturer, there are many other specialty functions to choose from such as hotel, dormitory, and automatic deadbolt lock. Figure 2.98 is a chart as listed in ANSI/BHMA A156.13 American National Standard for Mortise Locksets and Latches Series 1000, 2005.

Handing

As described in the Introduction, there are several ways to hand doors, frames, and hardware. Two- and three-point lockset hardware can be any hand if lever handles are used on both sides, including left hand (LH), right hand (RH), left hand reverse (LHR) or right hand reverse (RHR). When the two- or three-point lockset is a panic or fire exit hardware device, the handing will always be a reverse bevel (LHR or RHR). This is true because all handing is done from the secure or keyed side of the door, and with panic and fire exit hardware always on the push side of the door and free for exiting, the secure side is always the pull side of the door. If you are dealing with a passage function and there is no real secure side of the door in the locking sense, hand the door logistically as if there were an outside and inside, where the inside would have any visible mounting hardware such as screw heads.

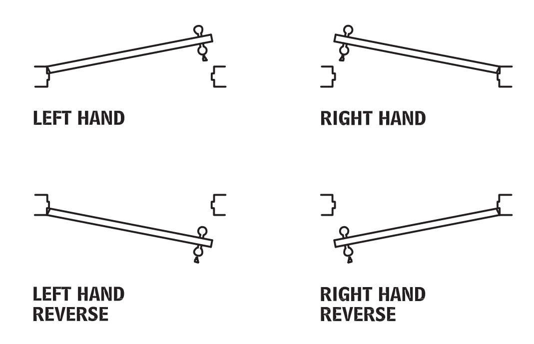


FIGURE 2.98 Door Handing Chart

(Source: The Graphics Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)

Hurricane Rating

Some manufacturers offer Federal Emergency Management Agency (FEMA) and ICC/NSSA International Code Council/National Storm Shelter Association three-point lockset ratings to meet hurricane and tornado safety standards. These standards require the door, frame, and hardware to be heavy-duty and reinforced assembly tested as is, including the installation of the frame to the surrounding wall.

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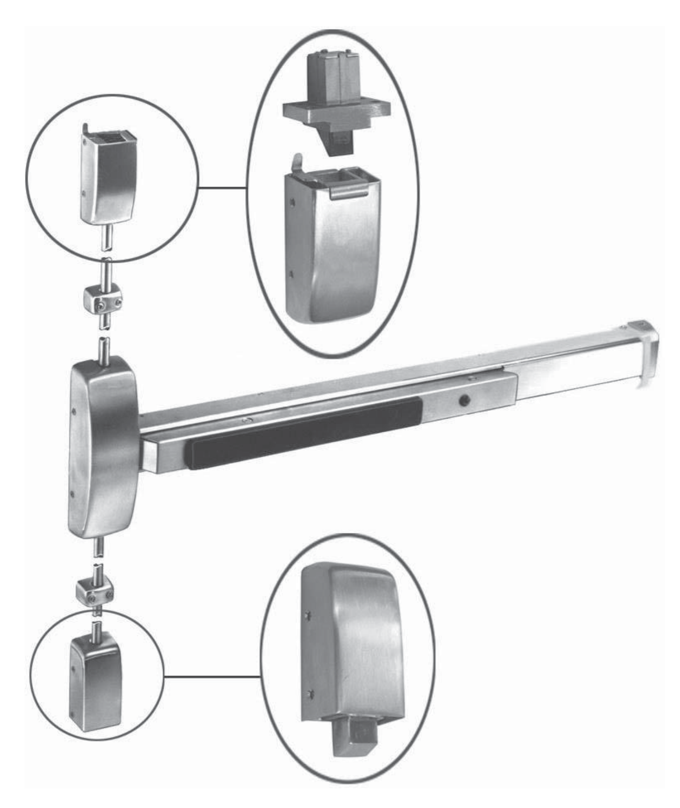


FIGURE 2.99 Hurricane Rated Exit Device and Latches.
(Source: Courtesy of SARGENT® Manufacturing Company)

Latching

Latching is a function of the two- and three-point lockset latchbolt, where it engages into the respective strike on the door frame. Depending on the device type, there are different latching options available, including top and bottom, top and side, or side and bottom.

CENTER AND BOTTOM

Center and bottom latching is not a typical application.

CENTER AND TOP

Center and top latching is typical on one leaf of a pair of doors with two-point locksets. There cannot be a top and center latching device on both leaves of a pair of doors. The latches at the center would hit each other and create a conflict with no strike for either to latch into; one leaf would have to have a device with just top latching. The center latch is approximately in the center of the height of the opening at the latch edge of the door.

TOP AND BOTTOM

Top and bottom latching is typical on both leaves of a pair of doors with two-point locksets. The latches are at the top and bottom corners of the latch edge of a door.

Although surface-mounted top and bottom vertical rod devices are available, accessibility codes and standards do not allow their use. The code roughly states that no projections are allowed off the lower face of the door at certain heights, depending on the code or standard.

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TOP, CENTER, AND BOTTOM

Top, center, and bottom latching is typical on one leaf of a pair of doors or a single door, possibly rated for hurricanes or tornados, with three-point locksets. There cannot be a center latching device on both leaves of a pair of doors as the latches at the center would hit each other and create a conflict with no strike for either to latch into; one leaf would have to have a device with just top and or top and bottom latching.

The center latch is approximately in the center of the height of the opening at the latch edge of the door and depending on the door type, anywhere from 38 inches to 40 5/16 inches above the finished floor and the top latch is at the top corner or the latch edge of a door.

Although surface-mounted center, top, and bottom two- and three-point locksets are available, accessibility codes and standards do not allow their use. The code roughly states that no projections are allowed off the lower face of the door at certain heights depending on the code or standard.

Luminous

Although the use of luminous materials was minimal and voluntary several years ago, there are some manufacturers that have manufactured these materials into their devices and are now prepared as they become requirements. Devices without this option will have to have the luminous materials applied to the device, as either a sticker or paint, neither of which are substantial and reliable materials for the application.

Codes such as the International Building Code (IBC) are becoming more detailed, with the requirement for luminous materials on panic and fire exit hardware on certain openings, which would include any two- or three-point locksets tested for the same. Section 1024 of the IBC states, "Where a panic bar is installed, such material shall be no less than 1 inch (25 mm) wide for the entire length of the actuating bar or touchpad."

ELECTRO

Electro-luminous material is a high-intensity light source that emits light through fire and smoke. This light source requires power and would have to be tied into a backup generator to operate. Although it is not part of the codes or standards that the luminous material be electric, there are manufacturers that have this type of panic and fire exit device available.



FIGURE 2.100 Electro-Luminous Exit Device
(Source: Courtesy of SARGENT® Manufacturing Company)

PHOTO

Photo-luminous material is a glow-in-the-dark light source that emits light through fire and smoke. This light source does not require power other than a separate light source shining on it to keep it charged. The codes and standards are typically met with this type of luminous material, and there are manufacturers that have this type of panic and fire exit device available.

Trim

Trim, also referred to as knobs, lever handles, or pulls, is available in many options and designs, depending on the manufacturer. The lever, knob, and pull designs are typically mounted on an

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FIGURE 2.101 Photo-Luminous Exit Device
(Source: Courtesy of SARGENT® Manufacturing Company)

escutcheon, which is a rectangular plate behind the lever or knob. This serves as a decorative plate, but conventionally also hides the fasteners behind the plate that are necessary to secure the device to the door.

ANTI-VANDAL TRIM

Anti-vandal trim is an available option for lever handle trim that takes the pressure off the lever handle. When a certain amount of pressure, determined when manufactured, is applied to a rigid or locked lever handle, the lever drops and separates itself from the stem so that the spindle and internal parts of the exit device do not get damaged. The lever can be reset by lifting it back into place, where the lever will operate the latch as required.

DECORATIVE

Trim can also be an aesthetic component of the outside panic or fire exit hardware. Some manufacturers offer many lever handle design choices for all hardware types; some have suites that allow consistent design on all hardware types, including panic and fire exit hardware. Other matching lever types include mortise locksets, electronic access control locksets, and tubular passage, privacy, and dummy trim. There are also suites of hardware available that include lever handles for locksets, pull handles for glass and sliding doors, drawer pulls, door stops, coat hooks, and hinges. With coordination, this would give the entire opening, interior, and building a consistent door-opening design.

ELECTRIFIED

Electrified trim is available on the outside of an exit device door so that a door can be accessed from the outside with an electronic access control system. Typically rigid, when a switch such as a card reader authorizes the credentials presented to it, the trim unlocks and is able to be rotated to retract the latchbolt, pull the door forward, and gain entry to the space. Other available trim options include fail-safe or fail-secure, voltage required, latch monitoring, lever monitoring, latch retraction, and request to exit functionality. See Options/Electrified in this section.

ESCUTCHEON

An escutcheon is a backplate to the trim and if there is one, a cylinder on the outside and thumb turn on the inside of the door. Escutcheons can be rectangular, oval, or custom in shape as well as flush, with pattern, or with framed edges.

HAZARD WARNING

Some standards and codes require that knobs and lever handles have a hazard warning signal for those who have a vision impairment. Manufacturers offer very limited choices to meet the hazard warning requirements. These are as follows:

Abrasive Coating

An abrasive coating is a nonsticky, black tar–like material with gravel-type material mixed into it. The material is a thick liquid when applied and coats the entire knob or lever handle, except for the cylinder opening. When dry, the trim has a rough, black tar–like coating and finish.

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FIGURE 2.102 Exit Device Escutcheon with Lever
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.103 Exit Device Escutcheon with Lever
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.104 Exit Device Pull Trim
(Source: Courtesy of SARGENT® Manufacturing Company)

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Knurled
A knurled handle has patterns of scored and removed metal on the surface of the knob or lever handle. These "bumps" are typically on the back side of the knob or handle where the fingers would feel the coarse, uneven surface and markings on the trim.

HEAVY DUTY
Heavy-duty trim is available for very frequently used door openings that might need to withstand high-abuse situations. This trim is typically very strong and will outlast conventional-duty trim.

KNOB
Knob trim is available for the outside operation of panic and fire exit hardware. Typical knobs are round, although some custom knobs might be more oval or square. In 1992, lever handles became the new standard, as knobs no longer met the requirements or complied with the ADA.

LEVER
Lever trim is available for the outside operation of panic and fire exit hardware. Typically elongated and extending horizontally across the door face at the door lock edge, lever handles have many designs and choices in aesthetic. Some manufacturers offer lever trim designs for their panic and fire exit hardware consistent with that of their other locking device offerings, such as mortise locksets or electronic access control locking hardware.

Lever handle trim became the new standard in 1992 to meet the new ADA standard and requirements. These and current requirements roughly state that doorways cannot be operated by a twisting or pinching motion, which is how a conventional doorknob is operated. With a lever trim, you can lean on the lever and still retract the latch to operate the door.

Certain codes require that the lever have a return to the door at its end, with no more than ½-inch clearance between the end of the return and the door face. This is to prevent anything from getting caught behind the lever handle, such as clothing or a fire hose prior to being filled with water.

PULL
Pull trim is a good option for panic and fire exit hardware for heavy-duty applications. The pull is typically rigid, although some have thumb pieces and or cylinders to retract the latch, and are ideal for use where the device might be dogged for long periods of time.

RIGID
Rigid trim is trim that does not move and is always fixed in one position. Examples of rigid trim are pull handles and dummy trim.

ROSETTE
Most exit devices are not available with a rosette option, which is a backplate to the outside trim, due to the mounting plates and screws that are required to mount the exit device on the opposite side of the door. The escutcheon is more likely used and is also used to cover all mounting plates and screws.

QUANTITIES

Two- and three-point locksets are applied in single quantities per door leaf. A single door would operate with one device, while a pair of doors might operate with two devices, although they might just operate with one device along with another hardware type such as flushbolts.

APPLICATIONS

Although most of the device applications have similar options, they are installed onto or into the door very differently.

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FIGURE 2.105 Exit Device Pull Trim
(Source: Courtesy of SARGENT® Manufacturing Company)

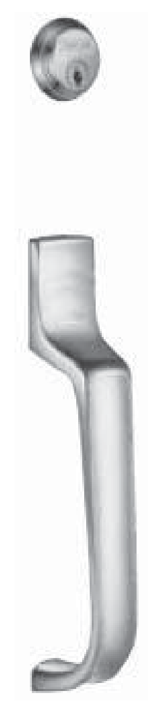


FIGURE 2.106 Exit Device Pull Trim
(Source: Courtesy of SARGENT® Manufacturing Company)

Concealed

Concealed devices are installed inside the door except for the operating components that must be visible for operation. Most commonly known is the concealed vertical rod exit device, where the device and chassis is visible on the surface or face of the door, but the rods and latches that the rods operate are all concealed in the edge of the door.

The integrated door opening assembly panic or fire exit hardware devices are also typically concealed inside of the door, including not only the rods and latches, but also the chassis.

Mortise

Mortise applications require the mortise lock, which is the locking device for mortise lock panic or fire exit hardware, to be mortised into a pocket at the lock edge of the door. Depending on the lockset function, cylinder and or lever handle holes will need to be made on the face of the door for operation of the same.

Surface Mounted

Surface-mounted devices are typically one of two types, a rim device or surface-mounted vertical rod panic or fire exit device. These devices are fully surface-mounted on the face of the door except for any function holes necessary for cylinders, trim, and the latch strikes on the frame.

INSTALLATION

Two- or three-point locksets are typically installed either fully or partially on the face of the door. Some devices are partially concealed, and some operate fully concealed inside the door. They all latch in

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some way into the frame, either side and top, top and bottom, or side, top, and bottom. All of the latch combinations extend into a strike on the frame at the same location as the door.

If a device is being installed on a stile and rail door, always confirm the lock stile dimensions to ensure that the device will have enough room to be installed.

Fasteners

Two- or three-point locksets are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Two- and three-point locksets should be installed at locations as recommended by industry standards and codes, which are typically measured from the finished floor. Depending on the door and frame type, whether considered standard or custom metal, wood, or aluminum, standards recommend starting the first hinge from the finished floor.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the centerline of the strike for side-latching devices on the frame installed at 40 5/16 inches.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have the centerline of the strike for side-latching devices on the frame installed at 38 inches.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors are recommended to have the centerline of the strike for side-latching devices on the frame installed at 40 5/16 inches.

Preparations

Two- and three-point lockset preparations are typically machined at the factory, including the drilling and tapping of screw holes. With metal doors and frames, the preparations are most typically reinforcements for the rail and chassis. Additional reinforcements, as recommended by the manufacturer, might include cutouts or reinforcements for surface- or concealed mounted vertical rod exit devices, including the channels for the concealed rods.

UNLATCH DEVICES

Also Known As: Release Device

DESCRIPTION

Unlatch devices can be used to regulate who passes through a door opening and all access points. Unlike an electric strike, where the latch of the lockset is held in a keeper that releases and allows the latch to pull away from the strike rather than being retracted from it, the unlatch device actually pushes the latch of the lockset out of the strike. When not in use, the unlatch device has a voice or standard keeper for the latch to rest in, but when activated, the void is filled by a moving bar used to push the latch out of the keeper in order to unlatch and open the door.

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Although they are used often and are more substantial than an electric strike, it is recommended that unlatch devices not be your first choice of use for security unless necessary in a retrofit environment as they are not as robust as an electromechanical locking device. Unlatch devices are more secure than



FIGURE 2.107 Electronic Unlatch Device
(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

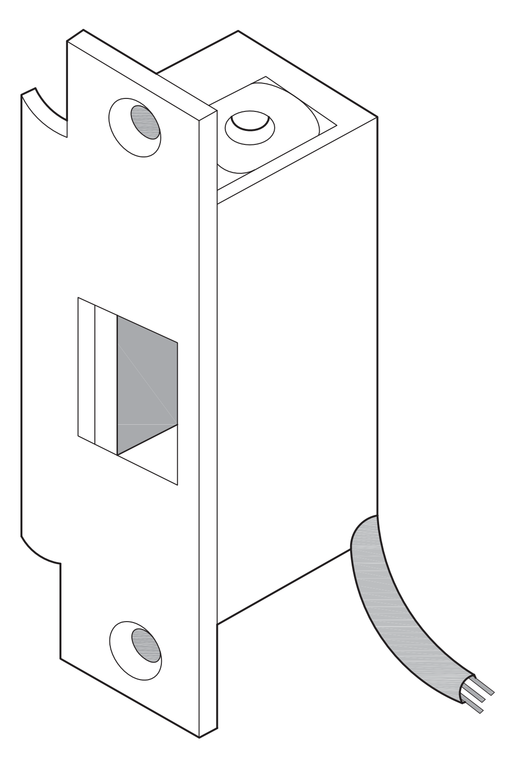


FIGURE 2.108 Electronic Unlatch Device Diagram
(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

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electric strikes due to the one-piece construction, which allows the latch to rest inside of the strike like a conventional strike plate and not rest behind a keeper that is held in place by pins and springs. Unlatch devices are ideal for traffic control or for audit trail records of an opening.

PROPERTIES

Unlatch devices have a conventional strike plate keeper, which is where the latch of the locking device engages. The strike keeper is fixed and, unlike an electric strike, pushes the latch of the locking device out rather than releasing it from the front when operated.

Finishes

Unlatch devices are typically available in a limited number of the basic finishes, depending on the manufacturer. The finish of the device is typically a cover plate that covers the exposed edge of the unlatch device.

Grades

Unlatch devices are tested and graded with levels of 1, 2, and 3 by ANSI/BHMA with grade 1 being the highest and best performing. The tests for the grade include cycle and strength tests.

Materials

Unlatch devices are typically manufactured from metal, plastic, and wire materials that operate inside of a metal or plastic housing.

TYPES

Bored

Bored unlatch devices are available to suit bored or cylindrical type locksets. The unlatch device is mortised into the strike frame jamb.

Mortise

Mortise unlatch devices are available to suit mortise locksets. The unlatch device is mortised into the strike frame jamb. Some mortise unlatch devices are able to accept not only the latchbolt of the locking device, but also the integrated deadbolt.

OPTIONS

Connectors

Electronic hardware has, historically, been connected by twisting together wires, but now there are plastic connectors that are prewired by the manufacturer so that their hardware will connect easily by plugging the devices together. Such connections are available on hinges that connect to door harnesses that carry power across the door to the locking device.

Ampere (Amp)

An ampere (amp) is a measure of the amount of electric charge passing a point in an electric circuit. In other words, it is the speed that the electricity travels through a device, wire, and system.

Current

Current requirements differ by manufacturer and device. Available as an alternating or direct current, they must be correctly coordinated in order to have proper operation and function of electrical devices.

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ALTERNATING CURRENT (AC)

Alternating current (AC) is the typical power used in our homes and standard outlets. The current is sent to and from the device in alternating directions. If you have ever noticed a buzzing sound at a door with an electric strike when power is sent to it, you are likely hearing the alternating current running through the device.

DIRECT CURRENT (DC)

Direct current (DC) can eliminate the buzzing sound and is a one-way current similar to that of a battery and does not create a buzzing sound.

Extended Lip

Depending on the manufacturer, electric strikes are available with the option to extend the lip of the strike. This would be necessary if the door were not flush with the edge of the door and inset into a reveal in the frame. This would give the latch a plate to rub against as it swings in and out of the reveal in the frame instead of possibly scraping against the frame's paint or finish and possibly scratching it.

Fail Safe

Fail-safe strikes are available to tie into a fire alarm system. This trim only locks when power is applied to the opening and unlocks when power is released. This function uses power all of the time, but is necessary to meet the codes in certain situations if electrification is necessary at the opening. The devices are manufactured differently, depending on the manufacturer and options, and can be operated by solenoid or a motorized mechanism, which would retract and throw the bolt accordingly, or simply allow the lever or knob to be rotated to retract the latch manually.

Fail Secure

Fail-secure strikes are available for locking and unlocking a device. This trim only unlocks when power is applied to the opening and locks when power is released. This device uses less power than fail safe, as the power is only used when necessary to open the device. The devices are manufactured differently, depending on the manufacturer and options, and can be operated by solenoid or a motorized mechanism, which would retract and throw the bolt accordingly, or simply allow the lever or knob to be rotated to retract the latch manually.

Voltage

Voltage requirements differ by manufacturer and device. Available with various voltages, such as 12 VAC or DC, and 24 VAC or DC, they must be coordinated properly in order to have proper operation and function of electrical devices. With that said, there are manufacturers that have devices that operate with multiple voltages, so one does not need to coordinate them when purchasing the devices, but you should do so when installing them to be certain there are no errors and the devices are not ruined and left unusable.

QUANTITIES

Unlatch devices are installed in single quantities of one device per latch.

APPLICATIONS

Mortise

Unlatch devices are mortised into the strike frame jamb, where power is run to the device, typically down the jamb from the ceiling above, where it is typically connected to a building's power supply.

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INSTALLATION

An unlatch device is typically installed on the frame or on the inactive leaf of a pair of doors, and the latchbolt and or deadbolt of the locking device is secured in the keeper of the strike. The latchbolt of the locking device is pushed through the strike and keeper of the unlatch device once the strike is released, not requiring the latchbolt to be retracted by the handle or knob as with mechanical strikes.

If an unlatch device is being installed on a stile and rail door, always confirm the lock stile's dimension to ensure that the device will have enough room to be installed.

Fasteners

Unlatch devices are typically installed with screw fasteners, which are available for wood or metal door and frame material. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Unlatch devices should be installed at locations as recommended by industry standards and codes, which are typically measured from the finished floor. Depending on the door and frame type, whether they are considered standard or custom metal, wood, or aluminum, standards recommend starting the first hinge from the finished floor.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the centerline of the strike on the frame installed at 40 5/16 inches.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have the centerline of the strike on the frame installed at 38 inches.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors are recommended to have the strike on the frame installed at 40 5/16 inches.

Preparations

Unlatch device preparations are typically machined at the factory, including the drilling and tapping of screw holes. With metal doors and frames, the preparation is typically a cutout in the location where an unlatch device will be installed.

ELECTROMAGNETIC LOCKSETS

Also Known As: Electromagnets, Magnetic Locks, Magnetic Locksets, Magnetic Locking Device

DESCRIPTION

Electromagnetic locksets were one of the first types of electrified locking devices, and although there are many new devices and technologies available, electromagnetic locksets are still used today. They are typically used on retrofit applications on existing doors and on stile and rail, full glass doors requiring minimal modification to the door, frame, and surrounding conditions as a way to add security

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and locking power, and to regulate who passes through a doorway or access point, by the use of a release device such as a card reader or keypad.

As with many codes and standards, through experience and time, these have changed through the years and language has been added to specifically address electromagnetic locksets, some prohibiting their use altogether.

Since electricity is required to power the magnet, all electromagnetic locks are fail-safe and will release and allow the door to be opened unless equipped with a backup power supply. Electromagnetic locks operate on DC power and, unlike electric strikes, are silent when locked or unlocked.

PROPERTIES

In addition to the wiring and electronic components inside of the device, there are two parts to an electromagnetic lockset, the magnetic lock body and an armature, both of which can be installed on the door or frame, depending on the application and available options from the manufacturer.

Armature

The armature is typically installed on the door and is the component that the electromagnetic lock aligns and secures with in order to lock the opening. The electromagnetic lock obviously needs electricity to operate, and the armature is basically a piece of metal that requires no power, which is likely why it is installed on the door, since the power originates from the wall and has to be transferred to the door through a transfer device. It is typically more secure and easier to install, and there are fewer possibilities for something to go wrong if the electromagnetic lock is installed on the door frame, which is easily connected to the power in the wall or ceiling above.

Body

The body is powered by electricity, which creates a very strong magnetic force that secures the door and frame by holding them together. If the electricity or power to the device is lost, the electromagnet will release from the armature, allowing the door to open. When it is in operation, release is achieved by switching off power to the magnet by the use of a release device, which is typically wired or tied into the electronic access control and security system. Release device options are a pushbutton switch, motion detectors, and biometric devices, which read unique characteristics of people such as fingerprints, the retina of the eye, vein patterns of the wrist, and the entire face.

Finishes

Typically available in the same finish as the body material used to manufacture the electromagnetic lockset, satin stainless steel, anodized aluminum finishes, satin aluminum, black, and brown are most common. A version primed for painting is also available, and some manufacturers offer cover plates, also known as dress covers, that allow customary and consistent finishes similar to the balance of the installed door hardware.

Grades

According to ANSI/BHMA A156.23 American National Standard for Electromagnetic Locks, 2012, electromagnetic locksets should meet the minimum testing standards. These testing standards include cycle and operational tests requiring minimum cycles of 250,000 for grade 3; 500,000 for grade 2; and 1,000,000 for grade 1.

Materials

Depending on the grade, quality, and manufacturer, electromagnetic lockset bodies can be manufactured from a steel (more commonly stainless steel) or aluminum material. The armature is

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typically manufactured from a steel material with through-bolts attached to the armature plate, which are used to attach the armature plate to the door.

TYPES

There is really only one type of electromagnetic lockset, where the body is powered by electricity and "locks" or adheres via electromagnet to the armature. The differences in the types of electromagnetic locksets are more in the various applications and options from the various manufacturers.

OPTIONS

Automatic Relock Timer

Once the power is removed from and unlocks the device, an automatic relock timer allows an electromagnetic lock to reset itself, power back up, and be ready to secure the opening again. The timer is typically adjustable and can be set anywhere from 0 to 30 seconds.

Brackets

Various brackets are available to suit common and unique door and frame applications and surrounding conditions.

ALUMINUM SHIM

An aluminum shim bracket is available to lift the electromagnetic lockset off the surface to accommodate installations, typically existing, that are not flush.

HEADER

As with all hardware that is installed into a frame cavity, a header bracket is available to give additional reinforcement to the shear lock or concealed electromagnetic lockset installations to give the hardware a more substantial installation into the void in the frame.

WOOD DOOR

As with all hardware that is installed into a door cavity, reinforcement brackets are available for wood door shear lock or concealed electromagnetic lockset installations to give the hardware a more substantial installation into the void in the door. This helps prevent the face, or veneer, of the door from being damaged or removed in part or altogether during installation or stressful use of the opening.

Z-BRACKET

Named Z-brackets due to their shape, these hardware pieces are available for in-swinging door installations. As with most door hardware, we try to keep anything that can be tampered with on the secure (or inside) of the opening. On a typical out-swinging door, the electromagnetic lock is installed on the push side of the door on the head of the frame. On in-swinging doors the stop of the frame is in the way, and in order to accommodate an armature alignment for locking, the Z-bracket is installed.

Camera

As the typical use of an electromagnetic lockset is to regulate who passes through a doorway or access point, by the use of a release device such as a card reader or keypad, and in order to consolidate devices and reduce the wiring requirements to an opening, some manufacturers have manufactured security cameras into their electromagnetic locksets as an added feature.

Clamps

Clamps are an option that secures the electromagnetic lockset with more than just electricity. In addition to the magnetic power, clamps affixed to the body latch onto the armature, holding it in place, increasing the holding force by thousands of additional pounds.

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FIGURE 2.109 Z-Bracket Installed on Door

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

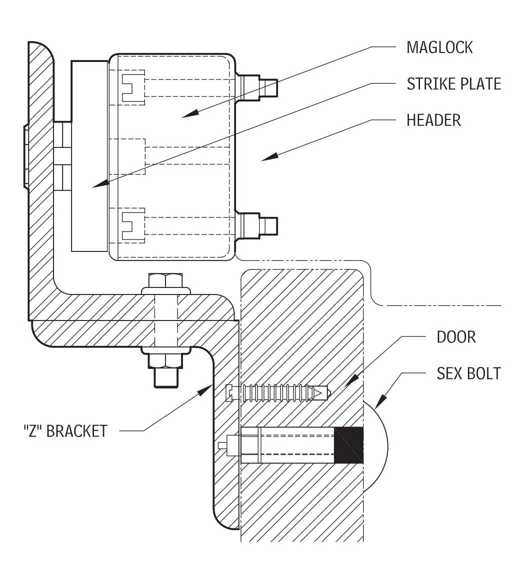


FIGURE 2.110 Z-Bracket Diagram

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)



FIGURE 2.111 Surface-Mounted Electromagnetic Lock with Camera

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

Conduit

Conduits are available for installations that require higher security and protection of the wires. Rather than having the wires exposed inside of the door and frame in route to their connections, such as the power supply and power transfer device, conduits are available to envelope and secure the wires, which helps deter tampering.

Connectors

Electronic hardware has historically been connected by twisting together wires, but now there are plastic connectors, typically Molex®, which are prewired by the manufacturer so that their hardware will connect easily by plugging the devices together. Such connections would be available on hinges that connect to door harnesses that carry power across the door to the locking device.



FIGURE 2.112 Molex Connectors

(Source: Courtesy of SARGENT® Manufacturing Company)

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Dress Covers

Electromagnetic locksets are typically available in stainless steel or anodized aluminum materials and finishes. Therefore, dress covers, also known as cover plates, are available to give the electromagnetic lockset additional finish options similar to the balance of the door opening in order to match it as closely as possible.

Exit Delay Timer

Also known as delayed egress timers, exit delay timers are typically used to alarm a door similarly to an alarm option, with the added feature of delaying the egress, or exit through the opening. There are certain codes and authorities that have jurisdiction that do not allow delayed egress devices due to their interpretation of the device being more harmful than helpful to people who use the opening.

If the device is allowed by code, there are typically requirements such as a maximum timed delay and notification by signage stating that there is a delay and the length of it. When codes do not allow a delayed egress function, an alarm option is typically used instead.

Fail Safe

Electromagnetic locksets require power to operate. Therefore, they are only available with fail-safe operation, which means they are devices that can tie into a fire alarm system. When power is removed, the lock releases, or unlocks, allowing the door to be opened. Fail-safe operation uses power all of the time, but is necessary to meet the codes in certain situations if electrification is necessary at the opening. The devices are typically operated by a solenoid.

Holding Force

Available for various applications, depending on the facility type and security required, electromagnetic locks are available in a range of holding forces from several hundred to several thousands of pounds. The holding force is the number of pounds pressure that must be applied to the opening with the intent to force the opening to unlock.

Housings

Available for surface-mounted applications, housings are typically metal materials shaped the same way as the electromagnetic lockset, manufactured the full width or height of the door opening. This is



FIGURE 2.113 Exit Delay Timer
(Source: Courtesy of SARGENT® Manufacturing Company)

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purely an aesthetic option to give the installation a full appearance rather than that of an installation on a short section of an opening with a void or space along the side of the device.

FULL LENGTH

Full-length housings are available for horizontal head of frame applications that extend from one frame jamb leg to the other.

VERTICAL

Vertically mounted housings are available for vertical applications, which typically include two magnets, one near the top and one near the bottom of the opening. This allows for an equal distribution of force and holding. If someone tried to pull the door and it was not secure at the bottom, for instance, there is a chance the door could be pulled or broken away, depending on the device and force applied. In lieu of installing the device as you would typically at the head of a door and frame, this would install from the foot of the frame along the entire height of the jamb leg to the frame head.

LED Indicator

Depending on the additional options and function of the electromagnetic lockset, some have light emitting diode (LED) lights to indicate certain functions or various statuses of the device.

Sealed

A sealed option does just that, seals the device from anything penetrating the inside and damaging the working electronic components. All corners, edges, connections, and seams are filled with an adhesive material that seals and bonds the edges to create a sealed box.



FIGURE 2.114 Vertically Mounted Electromagnetic Lock

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Sensors/Switches

ACCESS PANEL

Access panel sensors and switches are available in order to generate an alarm to prevent unauthorized access to the wires, boards, and configuration options of the device.

ARMATURE

Armature sensors and switches are available in order to generate an alarm in the event of the misalignment of the armature and the body.

DOOR POSITION

Door position switch applications typically send a signal when the door is in the open position and not properly in the frame and wired to an alarm and or computer system. The device can be a mechanical trigger depressed by a door when it closes into a frame or a magnetic device that aligns when the door and frame are flush in the closed position.

The newest in electromechanical devices functions, and some have a door position switch built into the device itself. With that said, the door position switch signal does not necessarily mean that the door is latched, locked, and secure, but there are other devices that can assist with that, including a latch position switch and electromechanical locking devices. The signal can be sent one or more of many ways, including as a local alarm at the door, a remote alarm at one's computer, or a text message to a cell phone.

REQUEST TO EXIT

Request to exit switches are an electrified option available to shunt an alarm during an authorized exit. Rather than using a separate motion sensor, which could act as a request to exit, requiring additional wiring and hardware to be installed on the door and frame, this option combines a motion sensor and electromagnetic lockset into one device. If a door has a local or remote alarmed exit hardware device, door and frame signal switch, or lever or latchbolt monitoring switch, a request to exit switch sends a signal to the contact, alarm, or computer stating that the doorway is being accessed from the exit side and that no credentials are required. This shunts the alarm, allowing the person to go through without having to present electronic credentials.

QUANTITIES

Electromagnetic locksets function in one set per door leaf, with an armature and body that are connected by wires to the required electrical voltage current. Single units with two magnets for a pair of doors all housed in one body are available, which require one point of wiring but also require both doors to operate in the same fashion at the same time, either both locked or both unlocked.



FIGURE 2.115 Double Surface-Mounted Electromagnetic Lock

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APPLICATIONS

An electromagnetic lock is typically installed on the frame or on the inactive leaf of a pair of doors, and the latchbolt and or deadbolt of the locking device is secured in the keeper of the strike. The difference between an electric strike and an unlatch device is that the keeper of an electric strike opens to release the strike, whereas the unlatch device pushes the latch out of the device, in reality retracting the latchbolt from the device.

Surface Mounted

Surface-mounted electromagnetic locksets are surface-mounted to the door and frame. The armature and required brackets are on either the door or frame and the electromagnetic lockset body is on the opposite side. As with most door hardware, we try to keep anything that can be tampered with on the secure side or inside of the opening.

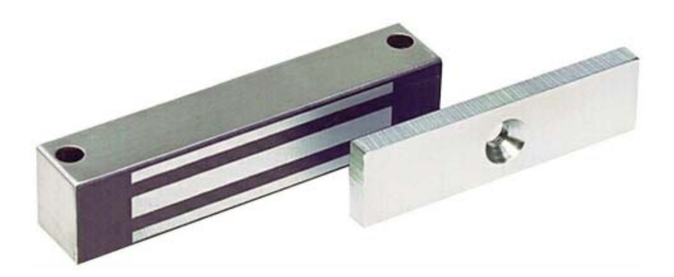


FIGURE 2.116 Single Surface-Mounted Electromagnetic Lock

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

IN-SWING

In-swing doors require the use of an additional bracket called the Z-bracket, so named because of its shape. On in-swinging doors the stop of the frame is in the way, and in order to accommodate an armature alignment for locking, the Z-bracket must be installed.

OUT-SWING

A typical out-swinging door has the electromagnetic lock installed on the push side of the door on the head of the frame.

Shear

Also known as concealed, shear electromagnetic locks are concealed in the door and frame and are only visible when the door is separated from the frame in the open position. The lock body is typically installed in the frame and the armature in the door, this way the wiring does not have to extend through a hanging device and into the door in order to power the device.

INSTALLATION

Electromagnetic locksets can be installed either on the face of the door and frame or mortised into the door and frame, also known as concealed or shear, and should be installed as recommended by the standards and manufacturers' recommendations.

As with any other type of door hardware device, although it is more aesthetically pleasing to install a concealed device, it might require consistent adjustments and maintenance.

Surface-mounted devices are more reliable and are installed either horizontally at the head of the frame and door or vertically along the lock and strike edge of the door and frame.

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FIGURE 2.117 Single Shear/Concealed Electromagnetic Lock

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

Be aware of surface electromagnetic lock installations. A surface-mounted device that is mounted on the top rail of a door might require a certain dimension of surface so that the device is not visible through the glass. For example, if a device closer requires 5 inches of surface to be mounted and the top rail is not coordinated and is only 4 inches, there are brackets that can assist in mounting the device, but 1 inch would be visible through the glass.

Fasteners

Electromagnetic locksets are typically installed with screw fasteners, which are available for wood or metal door and frame material. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx. The armatures can be installed on the door with through-bolts, which give it a more substantial installation able to withstand high abuse and frequent use.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Electromagnetic locksets should be installed at locations as recommended by industry standards, codes, and manufacturers' recommendations.

Preparations

Concealed or shear electromagnetic lockset preparations for metal doors and frames are typically machined at the factory, while wood door machining can be done either in the field or at the factory, including the drilling and tapping of screw holes. Reinforcements can be used as recommended by the manufacturer to give the installation additional support.

ACTIVE LEAF OF PAIR OR SINGLE DOOR

Once we complete the requirements for the inactive leaf of a pair of doors, or if we are working with a single door only, the following are the choices of hardware.

CYLINDER FOR LOCKING DEVICES

Please refer to Cylinder for Locking Devices in the Inactive Leaf section of this chapter.

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DEADLOCKS

Also Known As: Deadbolt

Considered an auxiliary lock, deadlocks are typically used for doors that are not in the path of egress such as a closet door or as a secondary locking device as on an apartment entrance door.

PROPERTIES

Deadlock bodies are manufactured as bored, mortise, or surface mounted. In addition to the body and depending on the function, options can include combinations of cylinders and thumb turns.

Anti-Microbial Coating

Deadlocks are available with an optional anti-microbial coating. The coating is a silver-ion–based clear coating that helps stop the spread of bacteria. Although there are silver ions, they are not visible to the eye and a brass or bronze finish shows its true color through the coating. Silver has been used throughout history to help reduce the spread of bacteria and infection: Why not put it on doors and hardware that is touched over and over again by numerous people in a day?

Backsets

Most deadlocks are available with a 2–3/4-inch backset. A backset is measured from the edge of the door along the face to the centerline of the cylinder keyhole. Most deadlocks are also available with a 2–3/8-inch backset. Some deadlocks are available with adjustable backsets, allowing you to switch between 2 3/8 inches and 2 3/4 inches. Although not common, there are backset deadlocks with custom dimensions available.

Bolt

The bolt is the locking portion of the device. It extends across the clearance, or gap between the door and frame, and into the strike plate. Some codes state that the bolt must extend into the strike at least ½ inch. Depending on the codes, the bolt can be extended with any combination on the inside and outside by a cylinder or thumb turn.

Case

Also known as the chassis or body of a bored or cylindrical deadlock, the case is where all of the components are connected and work together to operate.



FIGURE 2.118 Tubular Deadlock
(Source: Courtesy of SARGENT® Manufacturing Company)

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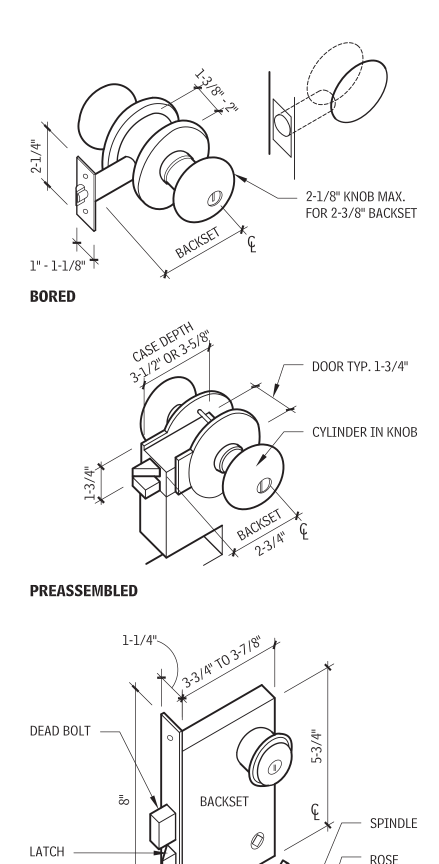


FIGURE 2.119 Backset Diagrams

(Source: The Graphic Standards Guide for Architectural Finishes, John Wiley & Sons, Inc.)

Cylinder

A cylinder is a component that the key enters and rotates in order to operate the deadlock. Please refer to Cylinder for Locking Devices in the Inactive Leaf section of this chapter.

Door Thickness

Deadlocks are available for standard 1–3/4-inch-and 1–3/8-inch-thick doors but have options to extend the cylinder and thumb-turn components to operate thicker doors.

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Finishes

Visible parts of a deadlock typically consist of a cylinder face, thumb turn if that is part of the function, front or faceplate on the edge of the door, and strike plate on the frame. Deadlocks are available in most architectural finishes, depending on the manufacturer and the availability of finish materials.

Front

The front is one of the visible parts of the deadlock and is the cover or faceplate on the edge of the door, covering the inside mechanisms of the deadlock and giving it a decorative cover.

Grades

Deadlocks are available in different grades, cited as grades 1 through 3, with grade 1 being the best and highest grade. Testing is different for interior and exterior openings. The following are a few of the areas for interior tests and standards per ANSI/BHMA A156.36 American National Standard for Auxiliary Locks, 2010.

Housing

Also known as the mortise body of a mini-mortise or mortise body, this is where all of the components are connected and work together to operate.

Lead Wrapped

Lead-wrapped deadlocks are available on mortise-type deadlocks. The lead is typically hand wrapped by the manufacturer for installations where one side of the door needs to protect against radiation escaping that room.

Materials

Deadlocks parts, including internal working parts, cylinders, thumb turns, decorative plates, and strikes can be manufactured from brass, bronze, zinc, stainless steel or steel and other metals or mixes of metals, depending on the manufacturer.

Strike Plate

Also referred to as a strike, the strike plate is typically a piece of metal that comes in standard sizes with a hole in the middle to accept the deadlock bolt in order to secure the opening. The strike is typically installed on the inactive leaf of a pair of doors or the strike jamb of a door frame, and typically has the same finish as the lockset and balance of hardware.

Thumb Turn

A thumb turn is a part of a deadlock that rotates and operates the deadbolt of the deadlock to extend and retract it. A thumb turn is typically installed on the inside of the door opening, allowing those securely inside to operate the thumb turn to unlock or lock the door from the inside of the space. A thumb turn may have limited operation, such as a classroom deadlock, which will only allow the user to unlock or disengage the deadbolt from the strike plate in lieu of both locking and unlocking it. This is a security feature that prevents someone with bad intentions from locking him- or herself in a public space with others, prohibiting the entry of rescuers from the outside.

Wrought Box

A wrought box strike is a strike plate with an added five-sided box behind it. This gives the deadbolt additional protection from the inside of the frame is used most typically when a frame is filled with concrete

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FIGURE 2.120 Deadlock Thumb Turn
(Source: Courtesy of SARGENT® Manufacturing Company)

for security and stability. Using a wrought box strike means the area where the deadbolt goes is safe; the concrete fills in around the box, allowing the bolt to have space behind the frame to work properly.

TYPES

Bored

Also Known As: Cylindrical

Similar to a bored lockset, this deadlock is a much simpler securing device than the mortise and is installed through a standard 2.126-inch (54-mm) hole bored through the door.

Mini-Mortise

Mini-Mortise deadlocks are very similar to mortise deadlocks, except the body is half the size or less of a standard mortise deadlock body.

Mortise

Able to withstand the most abuse, a mortise deadlock is one of the more durable and reliable types deadlocks. A pocket is prepared at the edge of the door into which the mortise deadlock body fits. While this pocket is standard, the locksets have different hub and cylinder spacing—these are the cutouts or preps needed for the cylinder and thumb turn, and they differ by manufacturer.

This means if the door is prepared for one manufacturer, but the deadlock specification is changed or another is substituted without approval, the holes in the field will have to be modified. This is a touchy subject when applicable to fire rated doors and is technically not allowed by code (although there are some circumstances that permit the modifications).

Rim

A rim deadlock sits on the face of a door flush with the *rim* of the door, also known as the door edge. This deadlock typically has a cylinder on the outside and a thumb turn on the inside of a door, but

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FIGURE 2.121 Mini-Mortise Deadlock
(Source: Courtesy of SARGENT® Manufacturing Company)

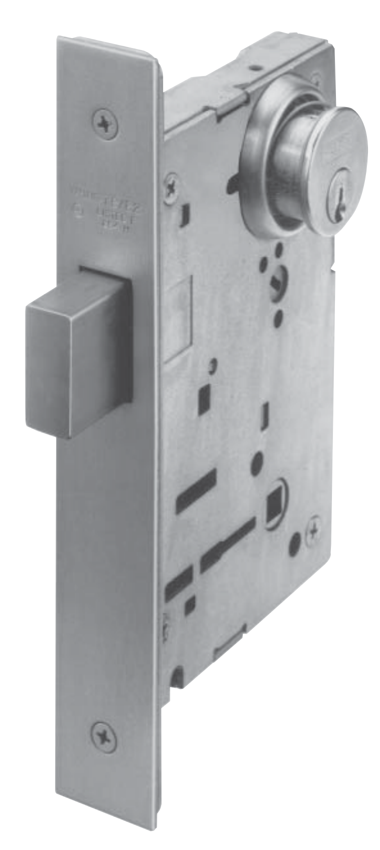


FIGURE 2.122 Mortise Deadbolt
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.123 Rim Deadlock
(Source: Courtesy of SARGENT® Manufacturing Company)

sometimes you might see a cylinder on both sides, where the occupancy, application, and codes allow (with other requirements of the application, places of worship might be one example of a deadlock with cylinders on both sides of the door).

The thumb turn and or key typically operate two drop bolts that align with a strike on the frame, preventing the door from swinging open when engaged. This type of device is typically a secondary lock in a dwelling or residential of apartment entrance.

Tubular

Tubular deadlocks do not have a body or chassis and require minimal preparation on the face of the door, but they still have to be prepared to accept the deadbolt on the edge of the door. The deadbolt

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FIGURE 2.124 Tubular Deadlock
(Source: Courtesy of SARGENT® Manufacturing Company)

is operated by the thumb-turn stems that extend through the deadbolt base inside of the door. By turning the thumb turn, the deadbolt is retracted or extended.

OPTIONS

Deadlocks do not have many options other than function and finish types. They are also distinguished by the type of bolt that the deadlock projects. A deadlock might have a bolt that flips up, projects out, or hooks into the frame. Hook bolts might be used on doors that slide and require the hook to hold the door secure against the frame jamb so that they cannot be pulled apart.

QUANTITIES

Deadlocks are typically installed one per door opening, whether a single door or a pair. The deadlock engages and secures into the inactive leaf of the pair of doors or the door frame of a single door application. It is possible to use more than one per opening (should someone wish to be creative), but typically there is only one.

APPLICATIONS

Bored

A bored deadlock application is a hole through the faces of the door and a preparation at the edge of the door for the latchbolt of a cylindrical or bored deadlock.

Surface Mounted

A surface-mounted deadlock application is typically a rim lock mounted on the face of one side of the door at the edge, or rim of the door, with a cylinder extended through the other side and face of the door.

Mortised

A mortised deadlock application is a deadlock that is installed in a mortised pocket on the edge of the door. The function, handle, cylinder, and thumb turn of any door preparations are on the face of the door, which line up with the same holes in the mortised lockset body or housing.

INSTALLATION

A deadlock device is typically installed on the door and secures into the door frame or the inactive leaf of a pair of doors, and the latchbolt and or deadbolt of the locking device is secured in the keeper of the strike. The applications, as shown in this section under Applications, are bored or mortised.

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If a deadlock is being installed on a stile and rail door, always confirm the lock stile dimensions to ensure that the device will have enough room to be installed.

Fasteners

Deadlock devices are typically installed with screw fasteners, which are available for wood or metal door and frame material. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Deadlock devices should be installed at locations as recommended by industry standards and codes, which are typically measured from the finished floor. Depending on the door and frame type, whether considered standard or custom metal, wood, or aluminum, standards recommend starting the first hinge from the finished floor.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the centerline of the strike on the frame installed at 48 inches.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have the centerline of the strike on the frame installed at 46 inches.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors are recommended to have the strike on the frame installed at 48 inches.

Preparations

Deadlock device preparations are typically machined at the factory, including drilled and tapped screw holes. With doors the preparations would be the mortised pocket or bored hole, and on the frame the preparation would be the strike plate.

DOOR POSITION SWITCHES

Please refer to Door Position Switches in the Inactive Leaf section of this chapter.

DUMMY TRIM

Refer to the Dummy Trim in the Inactive Leaf section of this chapter.

DUTCH DOOR BOLTS

Please refer to Dutch door bolts in the Bolts section of the Inactive Leaf section of this chapter.

ELECTRIC STRIKES

Please refer to Electric Strikes in the Inactive Leaf section of this chapter.

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ELECTROMAGNETIC LOCKSETS

Please refer to Electromagnetic Locksets in the Inactive Leaf section of this chapter.

LATCHSETS AND LOCKSETS

Also Known As: Latch or Lock, Latching or Locking Device

DESCRIPTION

Latchsets and locksets are available as various types, which bring varying levels of complexity for the preparation of a door and frame. While a latchset might be used simply to keep a door in the frame securely while providing a means to grab and open the door, a lockset typically provides security for any entry of authorized users from one space to another.

PROPERTIES

Latchsets and locksets are made up of various components. The body or chassis is where all of the components, such as handles, latches, and cylinders, come together to create the working device.

Anti-Microbial Coating

Latchsets and locksets are available with an optional anti-microbial coating. The coating is a silver-ion–based clear coating that helps stop the spread of bacteria. Although there are silver ions, they are not visible to the eye and a brass or bronze finish shows its true color through the coating. Silver has been used throughout history to help reduce the spread of bacteria and infection: Why not put it on doors and hardware that is touched over and over again by numerous different people in a day?

Backsets

Most latchsets and locksets are available furnished with a 2 3/4-inch backset. A backset is measured from the edge of the door along the face to the centerline of the cylinder keyhole. Depending on the manufacturer, latchsets and locksets are also available with other backsets, including 2 3/8-inch sets, with some having both narrower and longer options.

Bolt

See also, the Deadbolt and Latchbolt in this section. The bolt is the locking porting of the device. It extends across the clearance, or gap, between the door and frame and into the strike plate. Some codes state that the bolt must extend into the strike at least ½ inch. Depending on the codes, the bolt can be extended with any combination on the inside and outside by a cylinder or thumb turn.

Case

The case is also known as the chassis or body of a bored or cylindrical deadlock; it is where all of the components are connected and work together.

Connectors

Electronic hardware has historically been connected by twisting together wires, but now there are plastic connectors that are prewired by the manufacturer so that their hardware will connect easily by plugging the devices together. Such connections would be available on hinges that connect to door harnesses that carry power across the door to the locking device.

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Cylinder

Cylinders operate a lockset from the outside (and sometimes from the inside, depending on the application and code restrictions), in order for it to function.

Please refer to the Cylinder for Locking Devices in the Inactive Leaf section of this chapter.

Deadbolt

A deadbolt is a bolt that protrudes out of the side of the locking device. A deadbolt has a squared edge in the shape of a rectangle, rather than the triangular shape of a latchbolt. The deadbolt can be the only locking device, as with a deadlock, keeping the opening secure in the frame with the ability to retract the bolt and open the door from either side with a key or thumb turn. It can also be a secondary locking device used to complement a latch, incorporated into the same device, such as a mortise lockset with a deadbolt function. The deadbolt operates by rotating a thumb turn or key, extending across the clearance, or gap, between the door and frame and into the strike plate. Some codes state that the latchbolt must extend into the strike at least ½ inch.



FIGURE 2.125 Mortise Lock Deadbolt
(Source: Courtesy of SARGENT® Manufacturing Company)

Deadlatch

A deadlatch is a small bolt that protrudes out of the side of the locking device, but rather than engaging inside of a hole in a strike plate, it depresses up against the strike plate. This latch is a secondary measure to tell the locking device that the door is in the closed position, and further secures the latchbolt from being forced open without authorization to do so (without a key).

Door Thickness

Latchsets and locksets are available for standard 1 3/4-inch- and 1 3/8-inch-thick doors, but depending on the manufacturer, they may also have options to extend the cylinder and thumb-turn components to operate thicker doors.

Finishes

Finishes are applied to the visible parts of a latchset or lockset, typically consisting of a cylinder face, thumb turn if that is part of the function, front or faceplate on the edge of the door, strike plate on the frame, and operating handles, knobs, or pulls. Latchsets and locksets are available in most architectural finishes, depending on the manufacturer and their available selection.

Front

The front is one of the visible parts of the latchset or lockset and is the cover or faceplate on the edge of the door, covering the inside mechanisms, giving the latchset or lockset a decorative cover and finish to match the rest of the exposed hardware on the door.

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Grades

Latchsets and locksets are available in different grades, including grades 1, 2, and 3, with grade 1 being the best and highest grade. The various ANSI/BHMA American National Standards for latchsets and locksets, clearly state that the testing requirements are the minimum standards, and it is important to know that there are some manufacturers that just meet the minimum standards, while some go well above and beyond the standards, giving the device a much longer life cycle. What does this mean to the customer? It means fewer replacements, less labor to replace them, less cost, and less impact on the environment due to less materials ending up in the landfill over time.

Various tests that take place with locksets include door ram tests, to test the strength of the latches and bolts; impact tests, to test the strength of the device itself; torque tests, to test the strength of the lever handle and mechanisms behind them; and cycle tests, which test how many times the device has operated, such as how many times a handle is rotated, in turn retracting and extending the latchbolt.

Housing

Also known as the body of a latchset or lockset, this is where all of the components are connected and work together to operate the mechanism.

Latchbolt

A latchbolt is a bolt that protrudes out of the side of the latching or locking device. A latchbolt has a ramped edge in more of a triangular shape, rather than the rectangular shape of a deadbolt. The



FIGURE 2.126 Mortise Lock Latchbolt
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.127 Cylindrical or Bored Lock Latchbolt
(Source: Courtesy of SARGENT® Manufacturing Company)

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latchbolt can be a simple latching device that does not lock, but rather keeps the opening secure in the frame with the ability to retract the latch and open the door from either side at any time. It can also be a locking device that can be secured in the extended or latched position in the strike plate. The latchbolt operates on a spring and its natural position is extended; it extends across the clearance, or gap, between the door and frame and into the strike plate. Some codes state that the latchbolt must extend into the strike at least ½ inch. Depending on the codes, the latchbolt can be retracted by a thumb turn, knob, or most commonly a lever handle by rotating it. Once you release the handle, the latchbolt extends back out to its natural position.

Lead Wrapped

Lead-wrapped latchsets and locksets are available. The lead is typically hand-wrapped by the manufacturer around the body for installations where one side of the door needs to protect against radiation escaping that room possibly harming people on the nonradiation side of the door.

Materials

Latchsets' and locksets' parts, including internal working parts, cylinders, thumb turns, decorative plates, strikes, and handles, pulls, or knobs can be manufactured from brass, bronze, zinc, stainless steel, or steel and other metals or mixes of metals, depending on the manufacturer. Some manufacturers have options for rubber, nylon, leather, and other custom material pulls as well.

Strike Plate

Also referred to as a strike, the strike plate is typically a piece of metal that comes in standard sizes with a hole in the middle to accept the latchbolt or deadbolt in order to secure the opening. The strike is typically installed on the inactive leaf of a pair of doors or the strike jamb of a door frame and typically has the same finish as the lockset and balance of hardware. Strikes should cover the entire width of the rabbet of the frame, and if a longer reveal exists, custom length longer strikes should be used.

Thumb Turn

A thumb turn is a rotating part of a lockset that rotates and operates the deadbolt if included as a feature in the device. The thumb turn extends and retracts the latch or bolt, and it is typically installed on the inside of the door opening, allowing those securely inside to operate the thumb turn to unlock or lock the door from the inside of the space. A thumb turn may have limited operation, such as a classroom deadlock, which will only allow the user to unlock or disengage the deadbolt from the strike plate in lieu of both locking and unlocking it. This is a security feature that prevents someone with bad intentions from locking themselves in a public space with others, prohibiting the entry of rescuers from the outside.





FIGURE 2.128 Various Thumb Turns
(Source: Courtesy of SARGENT® Manufacturing Company)

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Wrought Box Strike

A wrought box strike is a strike plate with an added five-sided box behind it. This gives the deadbolt additional protection from the inside of the frame; it is used most typically when a frame is filled with concrete for security and stability. By using a wrought box strike, the area where the deadbolt goes is kept safe and the concrete fills in around the box, allowing the latchbolt or deadbolt to have space behind the frame to work properly.

TYPES

Bored

Also Known As: Cylindrical

A much simpler securing device than the mortise, this lock is installed through a standard 2.126-inch (54-mm) bored hole through the door—and typically, the only difference of the door



FIGURE 2.129 Bored Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)

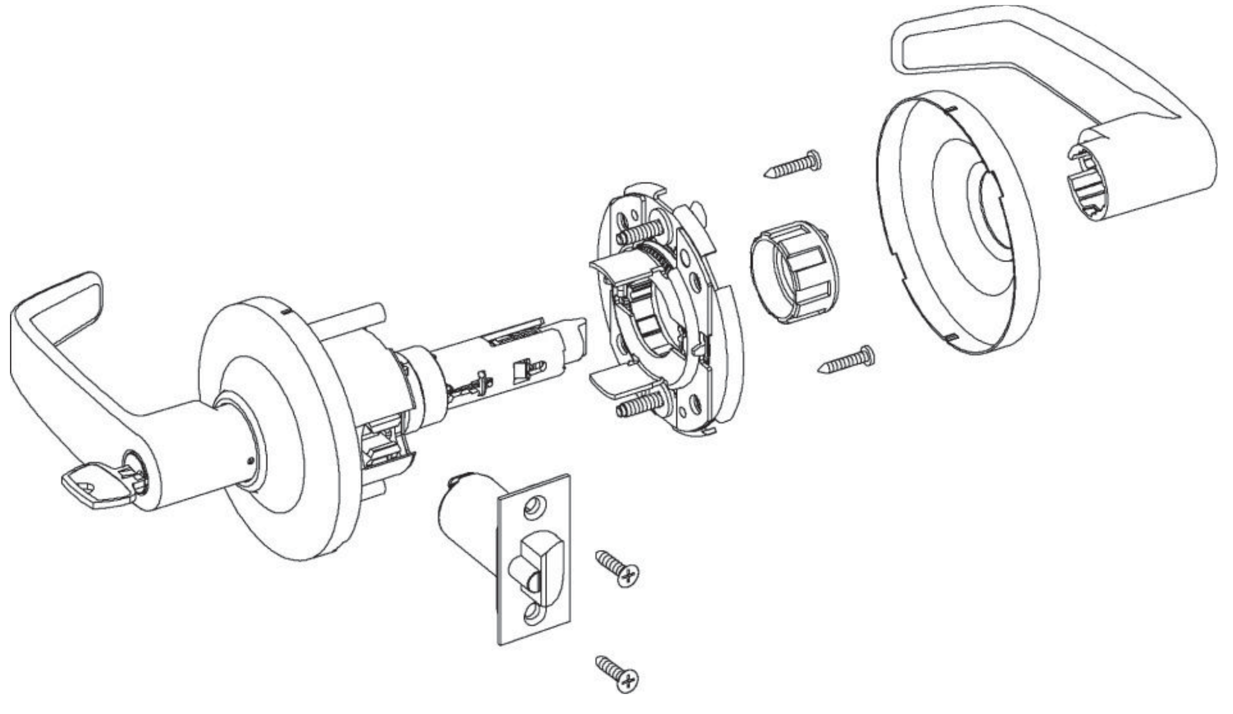


FIGURE 2.130 Bored Lockset Diagram
(Source: Courtesy of SARGENT® Manufacturing Company)

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FIGURE 2.131 Bored Lockset Lever Designs
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.132 Bored Lockset Rose Designs
(Source: Courtesy of SARGENT® Manufacturing Company)

preparation between those from the different manufacturers is the location of the through-bolt holes. Through-bolts clamp the lockset to the door, sandwiching the door in between the rosettes holding the lockset together, preventing the chassis from moving or rotating within the bored hole preparation.

Until approximately 1992, there were no lever handles and there were no through-bolts manufactured by any company. When one rotated the knob and put too much pressure on the rotation, the entire chassis could spin, knocking the latch out of alignment. This prevented the

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FIGURE 2.133 Bored Lockset Strike Plates
(Source: Courtesy of SARGENT® Manufacturing Company)

door from latching into the frame properly—a major issue with fire rated door codes. Fortunately, times have changed.

Bored locksets have a limited choice in lever design (typically three or four choices) and although some special functions are available, there are not as many as with mortise locks.

Cabinet

Although cabinet locks might sometimes be specified by a door hardware consultant or furnished by a door hardware distributor, they are typically specified in the cabinet specification section as included with the cabinet itself.

Interconnected

An interconnected lockset has two latching or locking devices built into one, a latchbolt, which may or may not lock, and a deadbolt. The special feature of this lockset is that when the lever handle is rotated, both the latchbolt and deadbolt retract simultaneously. This is important to know for egress code requirements, where doors in the path of egress must release with one motion, not the normal two that it takes to retract a latchbolt of one lock and the deadbolt of another.

Mortise

Able to withstand the most abuse, a mortise deadlock is one of the more durable and reliable types deadlock. A pocket is prepared at the edge of the door into which the mortise deadlock body fits. While this pocket is standard, the locksets have different hub and cylinder spacing—these are the cutouts or preps needed for the cylinder and thumb turn, and differ by manufacturer.

This means that, if the door is prepared for one manufacturer, but the deadlock specification is changed or another deadlock substituted without approval, the holes in the field will have to be modified. This is a touchy subject when applied to fire rated doors and is technically not allowed by code although there are some circumstances that permit the modifications. The same goes for a thumb turn if one is part of the function of the lockset on the inside of the door.

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FIGURE 2.134 Interconnected Lockset
(Source: Yale® Security, Inc.)



FIGURE 2.135 Mortise Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)

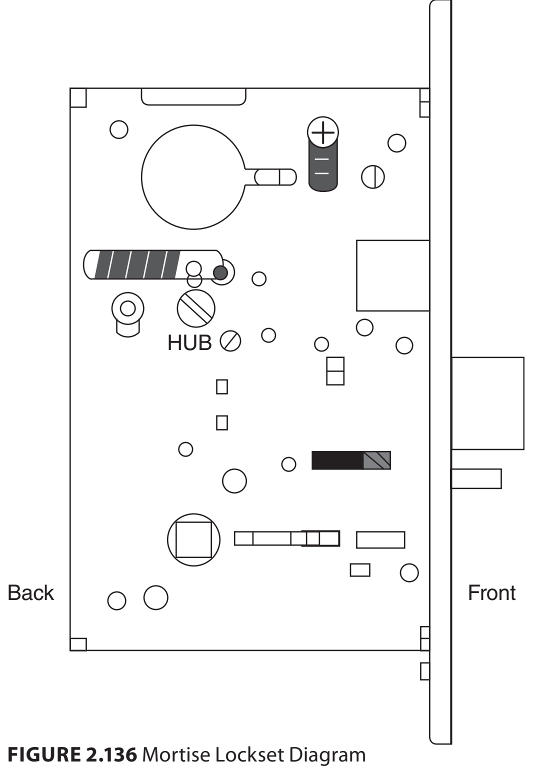


FIGURE 2.136 Mortise Lockset Diagram
(Source: Courtesy of SARGENT® Manufacturing Company)

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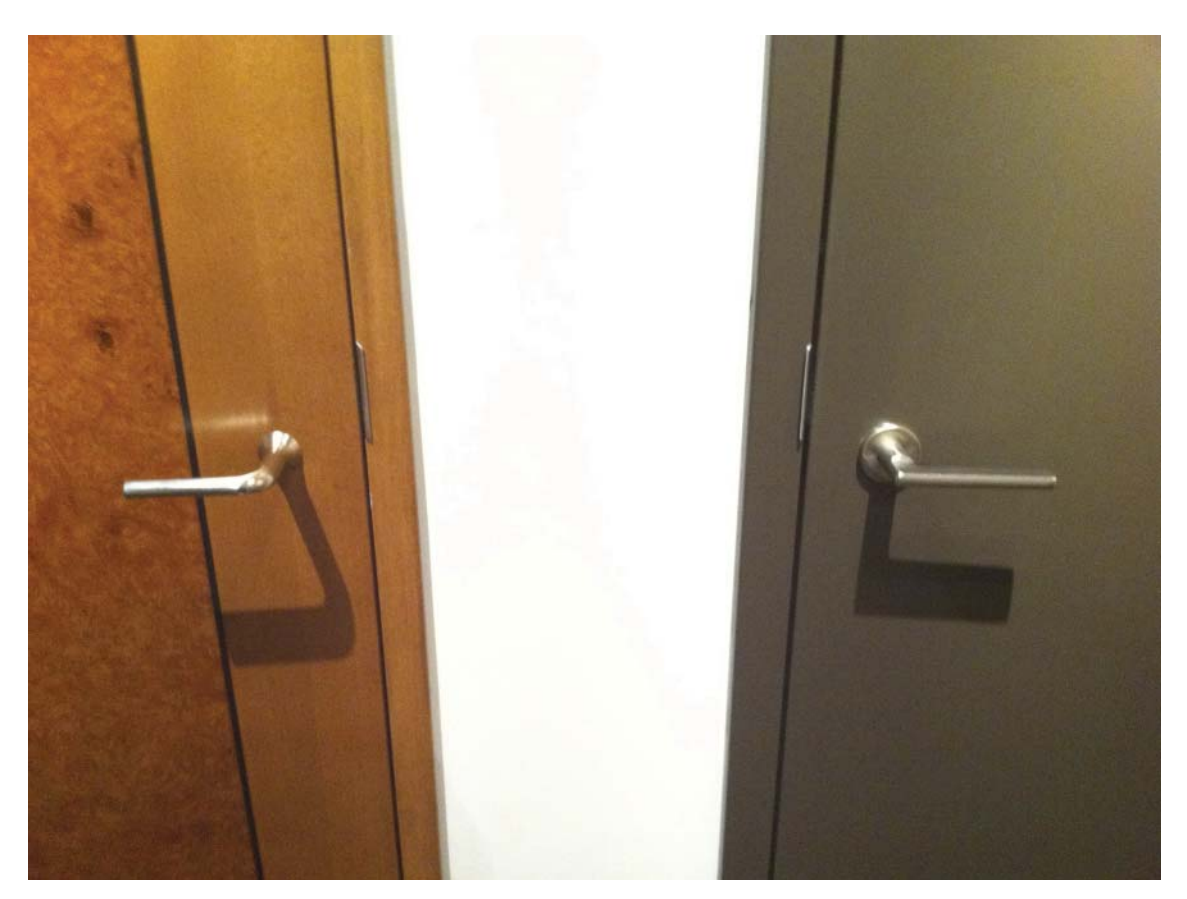


FIGURE 2.137 Mortise Lock Lever Designs
(Source: Courtesy of Scott J. Tobias)



FIGURE 2.138 Mortise Lock Roseless Trim Design
(Source: Courtesy of SARGENT® Manufacturing Company)

For mortise locksets that have a deadbolt feature, it is important to know that the deadbolt is retracted simultaneously with the latchbolt when the handle is rotated, for egress code requirements. Doors in the path of egress must release with one motion, not the normal two that it takes to retract a latchbolt of one lock and the deadbolt of another.

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FIGURE 2.139 Various Mortise Escutcheon Designs
(Source: Courtesy of SARGENT® Manufacturing Company)

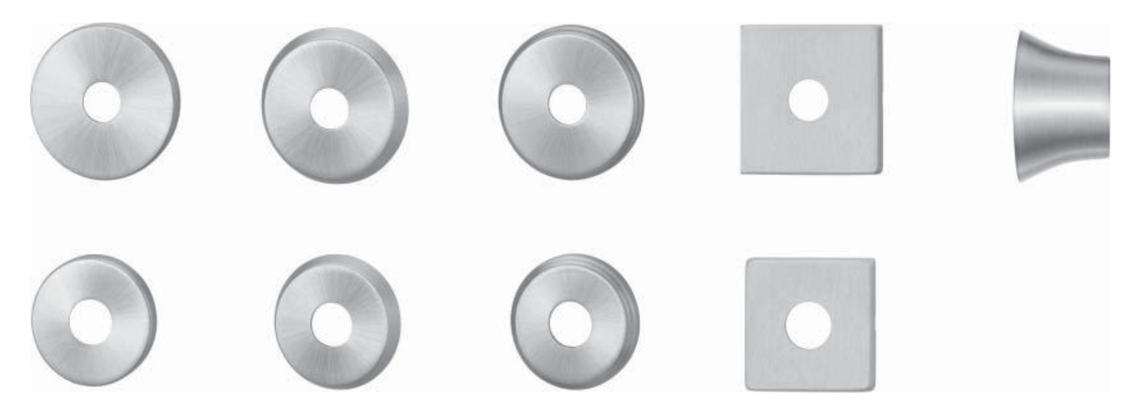


FIGURE 2.140 Various Mortise Rosette Designs
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.141 Various Mortise Thumb-Turn Designs
(Source: Courtesy of SARGENT® Manufacturing Company)

Preassembled

Also Known As: Cut and Notch

Preassembled locksets are called this because they are preassembled at the factory and installed onto the door in one piece. A notch is cut into the edge of the door into which the lockset is slipped and secured from the inside with screws.

Preassembled locksets are one of the more expensive locksets due to their being very substantial in makeup and cost to produce and its limited resources of manufacturing. Until several years ago, there was a single source of preassembled locksets, but now there are many imports that compete with the original.

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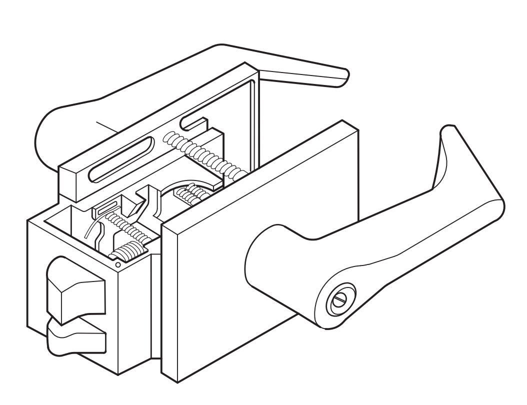


FIGURE 2.142 Preassembled Lockset Diagram
(Source: Corbin Russwin®, Inc.)



FIGURE 2.143 Preassembled Lockset
(Source: Corbin-Russwin®, Inc.)

Tubular

Tubular latchsets do not have a body or chassis. The latchbolt is operated by the thumb-turn stems through the deadbolt base. By turning the thumb turn, the latchbolt is either retracted or extended.

Although there are manufacturers who have many handle designs from which to choose, tubular sets are typically available in passage, privacy, and dummy functions. The reason for the limited available functions is the fact that the tubular device does not have the room that a body or chassis does. The latchbolt is operated by the handle's mounting stems or screws that go through the latchbolt base. By turning the handle, the latchbolt is retracted, which allows the door to be operated into the open position.



FIGURE 2.144 Tubular Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)

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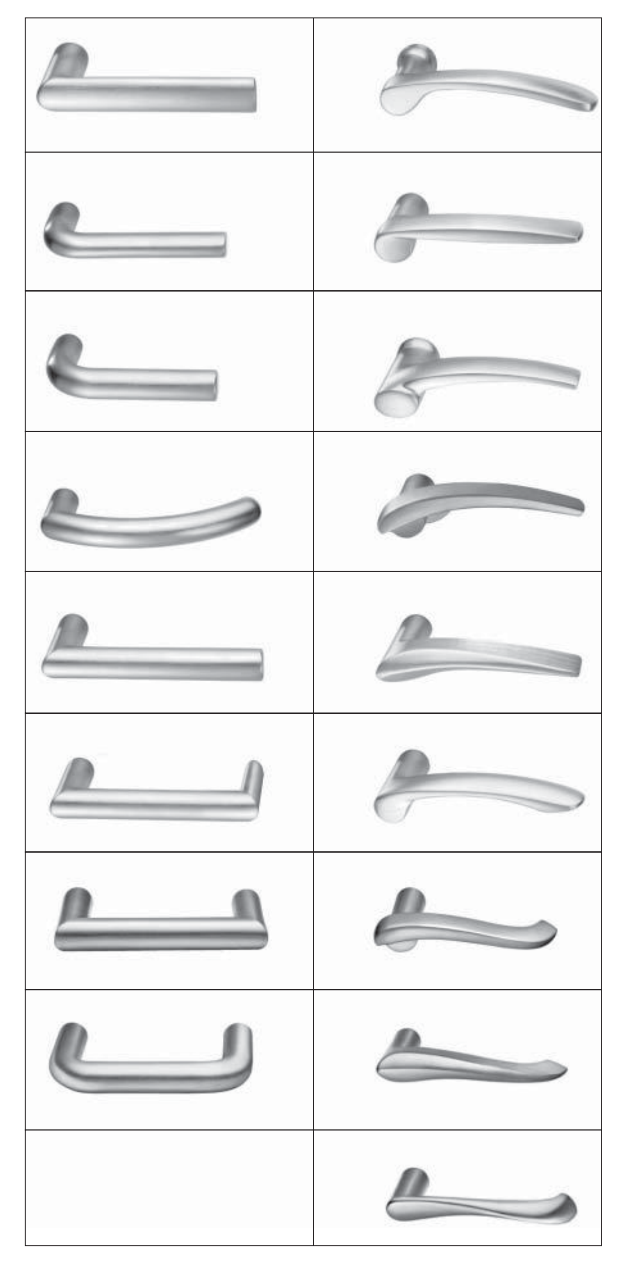


FIGURE 2.145 Tubular Lockset Lever Designs [c02f145.tif]
(Source: Courtesy of SARGENT® Manufacturing Company)

OPTIONS

Connectors

Electronic hardware has historically been connected by twisting together wires, but now there are plastic connectors that are prewired by the manufacturer so that their hardware will connect easily by plugging the devices together. Such connections would be available on hinges that connect to door harnesses that carry power across the door to the locking device.

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Cylinders

There are many cylinder options from which to choose. Please refer to the Cylinder for Locking Devices in the Inactive Leaf section of this chapter.

Electrification

BATTERY

Some electrified locking devices or components of a device, such as electronic trim, might operate on batteries if there is no hard-wired power source available to power the locking device or trim. Battery life on these types of devices has been optimized and gets better with new innovations. Some trim can last up to a year with indicator lights and or sounds that give you months of warning that the battery needs to be changed.

CREDENTIAL READERS

Locksets can be integrated with many functions and technologies such as electronic card readers, which have traditionally been installed on the wall next to the door opening and lockset. Card reader technologies include magnetic stripe, radio-frequency, and biometric components. With that said, there are various secure levels of radio frequencies, with greater encryption or security credentials required before access is authorized.

Credentials

Credentials are devices that are programmed into the security or access control system, so that when presented to the system, they can be confirmed or denied by it. In order to be accepted, they have to have been programmed so that the system recognizes them when presented.

Additionally, credentials leave a record, or audit trail, of what credential, belonging to whom, was presented and either opened or did not open that particular locking device and door.

BIOMETRICS

Biometrics is the newest and most expensive type of credential-reading device. Biometrics is the measurement and analysis of unique physical characteristics of people. Biometrics devices, depending on the device and manufacturer, can read our fingerprints, facial patterns, the iris or retina of the eye, the vein pattern beneath the wrist, and many other physical differences among each of us.

These characteristics must be programmed into the security or access control system by software and hardware that reads and stores our unique shapes and sizes in order to verify them later when presented to the reader.

CARD

A card key is a more commonly used type of electronic credential, where the card has the authorization to unlock a doorway to allow entrance. A card reader has historically been installed on the wall next to the opening, but technologies and solutions today allow the reader to be installed as part of the locking device.

The older cards have magnetic stripes, similar to the credit and ATM bank cards that we most commonly use today. They are also the cheapest and least secure as they can be copied and breached easily if you know how and have the proper equipment. This can be accomplished by purchasing a portable reader, which can be found online today and is fairly inexpensive.

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As this technology is easily defeated today, magnetic stripe card keys are now available with the ability to have a pin code programmed into them, so that once swiped, the pin code must match the user.

As a newer technology, computer chips, also known as smart chips, are built into the cards as the only, primary, or secondary means of security of the card. These cards might have the ability to be swiped if a magnetic stripe is available, or most typically a radio frequency (RF) signal is sent from the card to the reader without their having to make contact with each other.

When available to be programmed by the security or access control system, a secondary means of security can be built into the chip, which requires the use of a pin code or even a biometric read such as a thumbprint from the user.

FOB

A key fob is similar to the smart card and is a small plastic device that can be hung on a keychain like a conventional key. This technology also sends an RF signal between the fob and the card reader,



FIGURE 2.146 Magnetic Key Card
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.147 Radio Frequency Key Card
(Source: Courtesy of SARGENT® Manufacturing Company)

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FIGURE 2.148 Radio Frequency Key Card
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.149 Radio Frequency Key Card
(Source: Courtesy of SARGENT® Manufacturing Company)

confirming or denying credentials and allowing or preventing the door's unlocking for the user. Some key fobs have been turned into a bracelet, so that users can wear them around their wrists without worrying about losing the credential/key, and some require another credential verification device in order for the RF to operate, such as a biometric thumbprint reader, shown in Figure 2.150.



FIGURE 2.150 Biometric Reader Fob
(Source: Courtesy of SARGENT® Manufacturing Company)

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TAG

A key tag is similar to the smart card and key fob and is a small flat and thin plastic device that adheres to an existing credit card or key card that might be used to operate another device. This technology also sends an RF signal between the tag and the card reader, confirming or denying credentials and allowing or preventing the door's unlocking for the user.

HARD WIRED

Hard-wired devices have wires running directly into them from an outside power source. The outside power source can be a voltage source, such as 24 VAC, or a power over Ethernet source through your computer cables that connect your network to the Internet.

INTEGRATED WIEGAND

Electrified locksets are available with an integrated Wiegand card reader device. This reader is aproximity type, where the card is presented within proximity of the reader and is read by radio frequency rather than the card having to physically contact the surface of the reader. This reader has historically been installed on the wall next to the locked side of the door (if installed per most typical egress codes).

High-security integrated Wiegand locking devices are available, which have a higher level of security and data encryption that is required by most federal government agencies.

INTELLIGENCE

Locksets can be equipped with intelligence, similar to that of your automobile. The newer the automobile, the more intelligent it has become, with what is called CAN bus technology. Have you ever



FIGURE 2.151 Integrated Wiegand Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.152 Integrated Wiegand Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)

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FIGURE 2.153 Integrated Wiegand Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.154 High-Security Integrated Wiegand Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)

noticed when you turn the key, or nowadays push the ignition button, the lights and beeps and flashes almost talking to each other? That is CAN bus, CAN, short for controller area network, is a standard that allows devices to communicate with each other without a host computer or software.

KEYPAD

Electrified locksets are available with keypads. The keypads typically have numeric buttons or virtual touch screen buttons that are used to enter codes in order to gain authority to rotate the lever or knob and open the door. Keypads were the first type of keyless lockset in a mechanical form. Once the technology advanced in the industry, the electronic option became available.

LATCHBOLT MONITORING

Latchbolt monitoring is an electrified option that allows the monitoring of the latchbolt position, whether extended or retracted. This allows the signaling of any devices that have not extended and secured into the strike so that this can be followed up with in person to rectify the situation.

LEVER MONITORING

Lever monitoring is an electrified option that allows the monitoring of the lever handle position, whether rotated or in the rest position. This allows the signaling of any lever handle that is in the rotated position, indicating that the latchbolt is likely retracted and not secure in the strike.

POWER OVER ETHERNET

Devices that are powered over Ethernet are energized by the Ethernet cable that hard-wires the computers to the network and the Internet, instead of having a separate voltage power source. The advantages of this network is low power consumption and the fact that the network and door monitors are always live and talking to the system, ready to alert one of any suspicious activity.

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FIGURE 2.155 Electronic Keypad Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.156 Electronic Keypad Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.157 Power over Ethernet Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)

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REQUEST TO EXIT SWITCH

Request to exit switches are an electrified option available to shunt an alarm during an authorized exit. If a door has a local or remote alarmed exit hardware device, door and frame signal switch, lever or latchbolt monitoring switch, a request to exit switch sends a signal to the contact, alarm, or computer stating that the doorway is being accessed from the exit side and that no credentials are required. This shunts the alarm allowing the person to go through without having to present electronic credentials.

TRIM

Electrified trim is available on the outside of an exit device door so that a door can be accessed from the outside with the use of an electronic access control system. Typically rigid, when a switch such as a card reader authorizes the credentials presented to it, the trim unlocks and is able to be rotated to retract the latchbolt, pull the door forward, and gain entry to the space.

Fail Safe

Fail-safe door trim is available to tie into a fire alarm system. This trim only locks when power is applied to the opening and unlocks when power is released. This function uses power all of the time but is necessary to meet the codes in certain situations if electrification is necessary at the opening. The devices are manufactured differently, depending on the manufacturer and options, and can be operated by solenoid or a motorized mechanism, which retracts and throws the bolt accordingly or simply allows the lever or knob to be rotated to retract the latch manually.

Fail Secure

Fail-secure door trim is available for locking and unlocking a device. This trim only unlocks when power is applied to the opening and locks when power is released. This device uses less power than fail safe, as the power is only used when necessary to open the device. The devices are manufactured differently, depending on the manufacturer and options, and can be operated by solenoid or a motorized mechanism, which retracts and throws the bolt accordingly or simply allows the lever or knob to be rotated to retract the latch manually.

WIRELESS

In addition to the common household wireless fidelity (WiFi) that we all know and use for our wireless Internet access through the use of a wireless router connected to the modem, there are other wireless technologies available and incorporated into many existing mechanics, including electronic door locksets. Some of these low-power-consumption wireless technologies send wireless signals to local hubs separate from the 802.11 routers that we are used to in our homes.

WIRELESS FIDELITY

Devices that have WiFi technology are typically powered by battery. These devices communicate on the same 802.11 wireless networks that we use to transmit our Internet signal from the hard-wired modem into the air so that our computers and mobile devices can connect and use the signal to do various things, most commonly access the Internet. New devices that incorporate both the modem and router are available from some Internet access providers.

The WiFi sends and receives data to and from the computers and system. The advantages of this network is low power battery consumption and easy network installation and communication, especially in existing conditions where running hard wires is not efficient or sometimes even possible due to wall and frame materials. Although the system is not live all of the time, the network and door monitors “wake up” and talk to the system whenever there is any suspicious activity.

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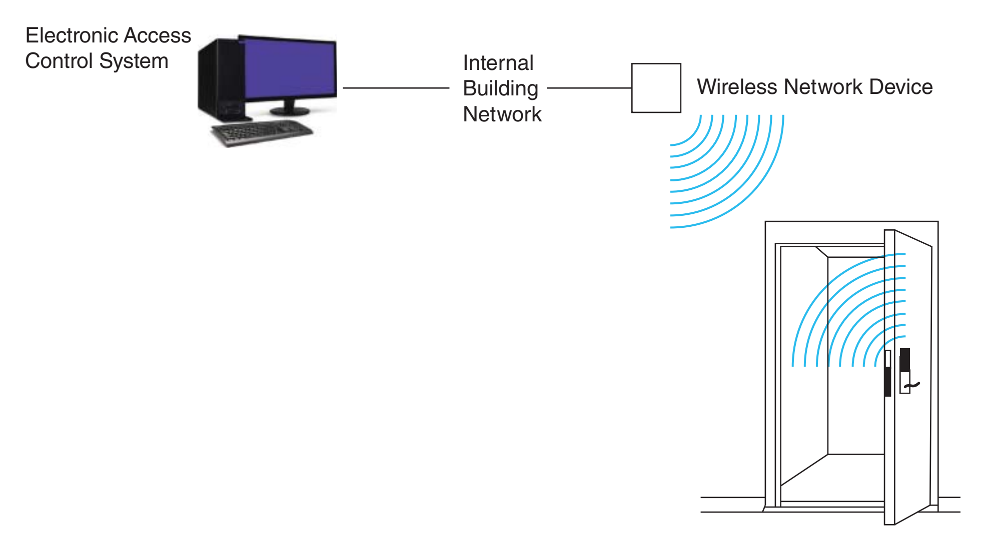


FIGURE 2.158 Wireless System Drawing
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.159 Wireless Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)

Fire Rating

Fire exit hardware devices are tested to meet fire standards and codes, allowing them to be installed and operated on fire rated door openings. Panic hardware is not necessarily tested and rated to meet fire standards and codes.

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FIGURE 2.160 Wireless Fidelity Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)

Functions

Depending on the manufacturer and reentry application, there are many functions available to operate the outside trim of panic and fire exit hardware. Functions range from simple mechanical passage and keyed locking to more technical options such as electronic locking and monitoring functions.

There are some more commonly used functions such as passage, privacy office, classroom, and storage. Although these functions are used the majority of the time, depending on the manufacturer's availability, there are many other specialty functions from which to choose, such as hotel, dormitory, and automatic deadbolt lock. Figure 2.161 is the chart as listed in ANSI/BHMA A156.13 American National Standard for Mortise Locksets and Latches Series 1000, 2005.

Handing

As described in the Introduction, there are several ways to hand doors, frames, and hardware. Locksets are always a standard handing from the outside or locked side of the door. Either left hand (LH) or right hand (RH). If you are dealing with a passage function and there is no real secure side of the door in the locking sense, hand the door logistically as if there were an outside and inside, where the inside would have any visible mounting hardware such as screw heads.

Hotel Indicator

A hotel indicator is used in order to identify the state of the opening to someone on the outside of the door. The indicator might use words, colors, or both, such as "Occupied" in red and "Unoccupied" in green.

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FUNCTION NUMBER	DESCRIPTION	APPLICABLE OPERATIONAL TEST BY APPLICATION TEST NUMBERS								CYCLE	APPLICABLE STRENGTH TEST BY APPLICATION						
		8.1.1	8.1.2	8.2	8.3	8.4	8.5	8.6	8.7	9	10.1	10.2	10.3	10.4	10.5	10.6	10.7
				0-I						0-I							
F01	Passage or Closet	N	N	Y-Y	Y	N	N	N	Y	Y-Y	N	Y	Y	Y	Y	N	Y
F02	Privacy	Y	N	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F03	Communicating	Y	N	Y-Y	Y	N	N	N	Y	Y-Y	N	Y	Y	Y	Y	N	Y
F04	Entry	N	N	Y-Y	Y	Y	Y	Y	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F05	Classroom	N	N	Y-Y	Y	Y	Y	Y	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F06	Holdback	N	N	Y-Y	Y	Y	Y	Y	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F07	Storeroom	N	N	N-Y	Y	Y	Y	Y	Y	N-Y	Y	Y	Y	Y	Y	N	Y
F08	Front Door	Y	Y	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F09	Apartment	N	N	Y-Y	Y	Y	Y	Y	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F10	Apartment Corridor Door	Y	Y	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F11	Dormitory or Exit	N	Y	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F12	Dormitory or Exit	Y	Y	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F13	Dormitory or Exit	Y	Y	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F14	Store Door	N	Y	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F15	Hotel	Y	N	N-Y	Y	Y	Y	Y	Y	N-Y	Y	Y	Y	Y	Y	N	Y
F16	Dead Lock	N	Y	N-N	N	N	N	N	Y	N-N	N	N	N	Y	N	N	Y
F17	Dead Lock	Y	Y	N-N	N	N	N	N	Y	N-N	N	N	N	Y	N	N	Y
F18	Dead Lock	N	Y	N-N	N	N	N	N	Y	N-N	N	N	N	Y	N	N	Y
F19	Privacy, Bedroom, Latch	Y	N	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F20	Apartment Corridor Door	Y	Y	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F21	Room Door	Y	Y	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F22	Privacy, Bedroom, Bath	N	N	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F24	Apartment	N	N	Y-Y	Y	Y	Y	Y	Y	Y-Y	N	Y	Y	Y	N	Y	Y
F25	Store Door	N	Y	Y-Y	Y	N	N	N	Y	Y-Y	N	Y	Y	Y	N	N	Y
F26	Institutional Privacy	N	N	Y-Y	Y	Y	Y	Y	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F27	Automatic Dead Bolt	N	Y	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F28	Automatic Dead Bolt	N	Y	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F29	Classroom Dead Lock	Y	Y	N-N	N	N	N	N	Y	N-N	N	N	N	Y	N	N	Y
F30	Asylum or Institutional	N	N	N-N	Y	Y	Y	Y	Y	N-N	Y	Y	Y	Y	Y	N	Y
F31	Exit or Communicating	N	N	N-Y	Y	N	Y	Y	Y	N-Y	Y	Y	Y	Y	Y	N	Y
F32	Intruder Latch	N	N	Y-Y	Y	Y	Y	Y	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F33	Intruder Dead Bolt	N	Y	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F34	Intruder Dead Bolt	N	Y	Y-Y	Y	N	Y	Y	Y	Y-Y	Y	Y	Y	Y	Y	N	Y
F35	Store Door Lock	N	Y	Y-Y	Y	N	N	N	Y	Y-Y	Y	Y	Y	Y	Y	N	Y

FIGURE 2.161 ANSI/BHMA Lockset Function Chart (continues)
(Source: Builders Hardware Manufacturers Association)

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FUNCTION NUMBER	DESCRIPTION	APPLICABLE MATERIAL EVALUATION			APPLICABLE SECURITY TEST BY APPLICATION											APPLICABLE FINISH TEST BY APPLICATION				
		TEST NUMBERS																		
		11.1	11.2	11.3	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	12.10	12.11	13.1	13.2	13.3	13.4	13.5
F01	Passage or Closet	Y	Y	Y	N	N	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	Y
F02	Privacy	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
F03	Communicating	Y	Y	Y	Y	Y	Y	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
F04	Entry	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
F05	Classroom	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
F06	Holdback	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
F07	Storeroom	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
F08	Front Door	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F09	Apartment	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
F10	Apartment Corridor Door	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F11	Dormitory or Exit	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F12	Dormitory or Exit	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F13	Dormitory or Exit	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F14	Store Door	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F15	Hotel	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F16	Dead Lock	N	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F17	Dead Lock	N	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F18	Dead Lock	N	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F19	Privacy, Bedroom, Latch	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
F20	Apartment Corridor Door	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F21	Room Door	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F22	Privacy, Bedroom, Bath	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	N	Y	Y	Y	Y	Y	Y
F24	Apartment	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
F25	Store Door	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F26	Institutional Privacy	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
F27	Automatic Dead Bolt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F28	Automatic Dead Bolt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F29	Classroom Dead Lock	N	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F30	Asylum or Institutional	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
F31	Exit or Communicating	Y	Y	Y	Y	Y	Y	N	N	N	N	N	Y	N	Y	Y	Y	Y	Y	Y
F32	Intruder Latch	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
F33	Intruder Dead Bolt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F34	Intruder Dead Bolt	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
F35	Store Door Lock	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

FIGURE 2.161 ANSI/BHMA Lockset Function Chart (continues)

(Source: Builders Hardware Manufacturers Association)

Keypad

The first keyless lockset was a mechanical keypad. The buttons were typically numbers that are used to enter a combination in order to unlock the lock, rotate the handle or knob, and retract the latchbolt in order to open the door. Once electronic technologies reached door hardware, keypads became electronic, similar to smart phones.

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Latching

Latching is a function of the latchbolt of a latch or lockset. The latchbolt is angled so that it can engage and slide into a strike plate and is typically installed on a door frame. Depending on the device type, there are different latching options available, some of which include monitoring switches to determine whether or not the latch is projected properly from a remote location and via an alarm or computer.

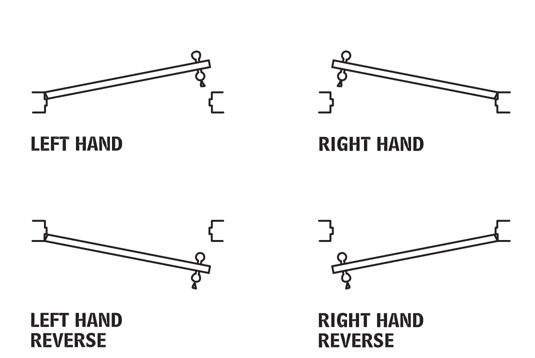


FIGURE 2.162 Door Handing Chart

(Source: The Graphics Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)



FIGURE 2.163 Hotel Function Mortise Lockset with Outside Indicator

(Source: Builders Hardware Manufacturers Association)



FIGURE 2.164 Electronic Touch Screen Keypad Lockset

(Source: Courtesy of SARGENT® Manufacturing Company)

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Trim

Trim, also referred to as knobs, lever handles, or pulls, is available in many options and designs depending on the manufacturer. The lever, knob, and pull are typically mounted on an escutcheon, which is a rectangular plate behind the lever or knob. This serves as a decorative plate, but conventionally also hides the fasteners behind the plate that are necessary to secure the device to the door.

ANTI-VANDAL TRIM

Anti-vandal trim is an available option for lever handle trim that takes the pressure off of the lever handle. When an amount of pressure predetermined when the device is manufactured, is applied to a rigid or locked lever handle, the lever drops and separates itself from the stem so that the spindle and internal parts of the exit device do not get damaged. The lever can be reset by lifting it back in place, where the lever will operate the latch as required.

BEHAVIORAL HEALTH

This trim has been designed to minimize the possibility of someone harming themselves. Many strict guidelines must be met to obtain one of the many rating levels for safety, and many tests are performed. One test includes the ability to tie a string, shoelace, or wedge any item around the trim that would harm someone or affect the operation of the device and opening.

Knob

Designed with slight indentations for gripping and rotating purposes, the behavioral health knob is available. It might be possible that certain areas and doorways of behavioral health facilities occupancy might not need to comply with ADA.



FIGURE 2.165 Behavioral Health Lever Trim
(Source: Courtesy of SARGENT® Manufacturing Company)

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FIGURE 2.166 Behavioral Health Lever Trim
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.167 Behavioral Health Paddle Trim
(Source: Courtesy of SARGENT® Manufacturing Company)

Lever

Designed in the shape of a lever handle, these devices have met some of the guidelines and give the opening a more conventional aesthetic rather than that of a healthcare facility. Some manufacturers have more options, follow more guideline standards, and have enhanced the operation and aesthetics of the device.

Paddle

Paddle trim is designed to both assist with minimizing harm and operation and to assist with ease of operation of the door opening. One could easily manage the paddle while carrying something, as compared to having to rotate a lever handle to gain entry.

DECORATIVE

Trim can also be an aesthetic component of the locksets and latchsets. Some manufacturers offer many lever handle design choices for all hardware types; some have suites that allow consistent design on all hardware types. Other matching lever types include exit devices, electronic access control locksets, and tubular passage, privacy, and dummy trim. There are also suites of hardware available that include lever handles for locksets, pull handles for glass and sliding doors, drawer pulls, door stops, coat hooks, and hinges. With coordination, this would give the entire opening, interior, and building a consistent door-opening design.

ELECTRIFIED

Electrified trim is available on the outside of an exit device door so that a door can be accessed from the outside with an electronic access control system. Typically rigid, when a switch such a card reader authorizes the credentials presented to it, the trim unlocks and is able to be rotated to retract the

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FIGURE 2.168 Suited Door Hardware
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.169 Suited Door Hardware
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.170 Suited Door Hardware
(Source: Courtesy of SARGENT® Manufacturing Company)

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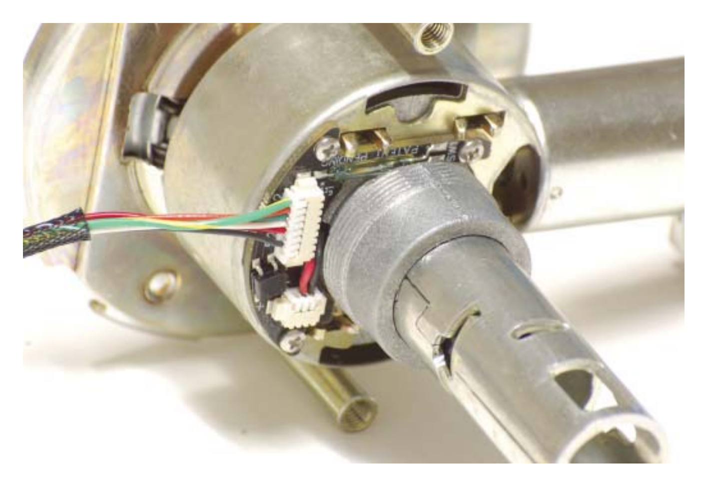


FIGURE 2.171 Electrified Bored Lockset Chassis
(Source: Courtesy of SARGENT® Manufacturing Company)

latchbolt, pull the door forward, and gain entry to the space. Other available trim options include a fail-safe or a fail-secure function, the voltage required, latch monitoring, lever monitoring, latch retraction, and request to exit. See the Options/Electrified in this section.

ESCUTCHEON

An escutcheon is a backplate to the trim and, if there is one, has the cylinder on the outside and a thumb turn on the inside of the door. Escutcheons can be rectangular, oval, or custom in shape and can be installed flush, with pattern, or with framed edges.

HAZARD WARNING

Some standards and codes require that knobs and lever handles have a hazard warning signal for those who have vision impairment. Manufacturers offer very limited choices to meet the hazard warning requirements, as follows.

Abrasive Coating

An abrasive coating is a nonsticky, black tar–like material with gravel-type material mixed into it. The material is a thick liquid when applied and coats the entire knob or lever handle, except for the cylinder opening. When dry, the trim has a rough, black tar–like coating and finish.



FIGURE 2.172 Various Escutcheons
(Source: Courtesy of SARGENT® Manufacturing Company)

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Knurled

A knurled handle has patterns of scored on and metal removed from the surface of the knob or lever handle. These "bumps" are typically on the back side of the knob or handle where the fingers would feel the coarse, uneven surface and markings on the trim.

HEAVY DUTY

Heavy-duty trim is available for very frequently used door openings that might need to withstand high-abuse situations. This trim is typically very strong and will outlast conventional duty-trim.

KNOB

Knob trim is available for the outside operation of panic and fire exit hardware. Typical knobs are round, although some custom knobs might be oval or square. In 1992, lever handles became the new standard, as knobs no longer met the requirements or complied with the ADA.

LEVER

Lever trim is available for the outside operation of panic and fire exit hardware. Typically elongated and oriented horizontally across the door face at the door lock edge, lever handles have many designs and choices in aesthetic. Some manufacturers offer lever trim designs for their panic and fire exit hardware consistent with their other locking device offerings, such as mortise locksets or electronic access control locking hardware.

Lever handle trim became the new standard in 1992 to meet the new ADA standard and requirements. These and current requirements roughly state that doorways cannot be operated by a twisting or pinching motion, which is how a doorknob is conventionally operated. With a lever trim, you can lean on the lever and still retract the latch to operate the door.

Certain codes require that the lever have a return to the door at its end, with no more than ½-inch clearance between the end of the return and the door face. This is to prevent anything from getting caught behind the lever handle, such as clothing or a fire hose prior to being filled with water.

RIGID

Rigid trim is trim that does not move and is always fixed in one position. Examples of rigid trim are pull handles and dummy trim.

ROSETTE

A rosette is a backplate to the trim on both the outside and inside of the door. Rosettes can be rectangular, round, oval, or custom in shape and are installed flush, with pattern, or with framed edges.

QUANTITIES

Latchsets and locksets are typically used in quantities of one per door opening for either a single door or a pair of doors. With that said, there are some applications and locking devices that might allow the use of two latchsets or locksets on a pair of doors. One application would be a Dutch door that might use a deadlock to keep the top and bottom leaves together and secure. Another application might be a pair of doors that are installed in a frame with a center mullion. In this case, unless codes require egress panic or fire exit hardware, a lever latch or lockset could be used on both leaves.

APPLICATIONS

Bored

A bored latchset or lockset application has a hole through the face of the door and a preparation at the edge of the door for the latchbolt of a cylindrical or bored deadlock.

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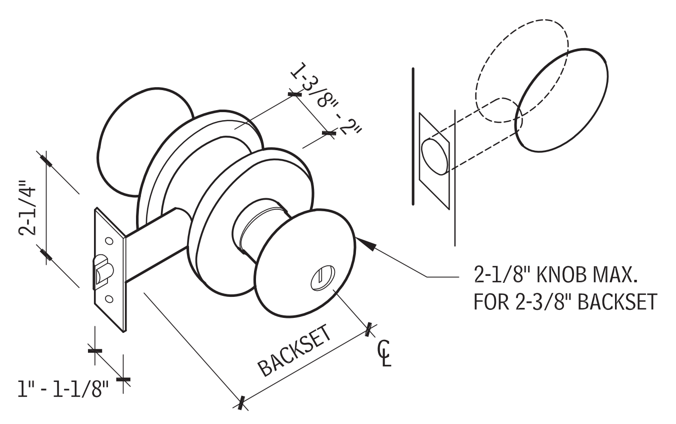


FIGURE 2.173 Various Lever Handle Designs
(Source: Courtesy of SARGENT® Manufacturing Company)

Detention

A detention grade lockset is a very heavy-duty basic locking device that is typically operated by what is known as a mogul key. The mogul key is very large with large cutouts where it engages into the lockset to operate the deadbolt or latchbolt.

Mortise

A mortised latchset or lockset application is a latchset or lockset that is installed in a mortised pocked on the edge of the door. The function, handle, cylinder, and thumb turn of any door preparations are on the face of the door and line up with the same holes in the mortised lockset body or housing.

Rim

A rim-mounted latchset or lockset application is a device surface-mounted on the face of the door. This is not a common application or device used as a primary means of securing a door, but might be more likely a secondary means such as a deadlock.



FIGURE 2.174 Bored Lever Handle Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)

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FIGURE 2.175 Bored Knob Lockset
(Source: Courtesy of SARGENT® Manufacturing Company)



FIGURE 2.176 Bored Lever Handle Lockset Installed on Door
(Source: Courtesy of SARGENT® Manufacturing Company)

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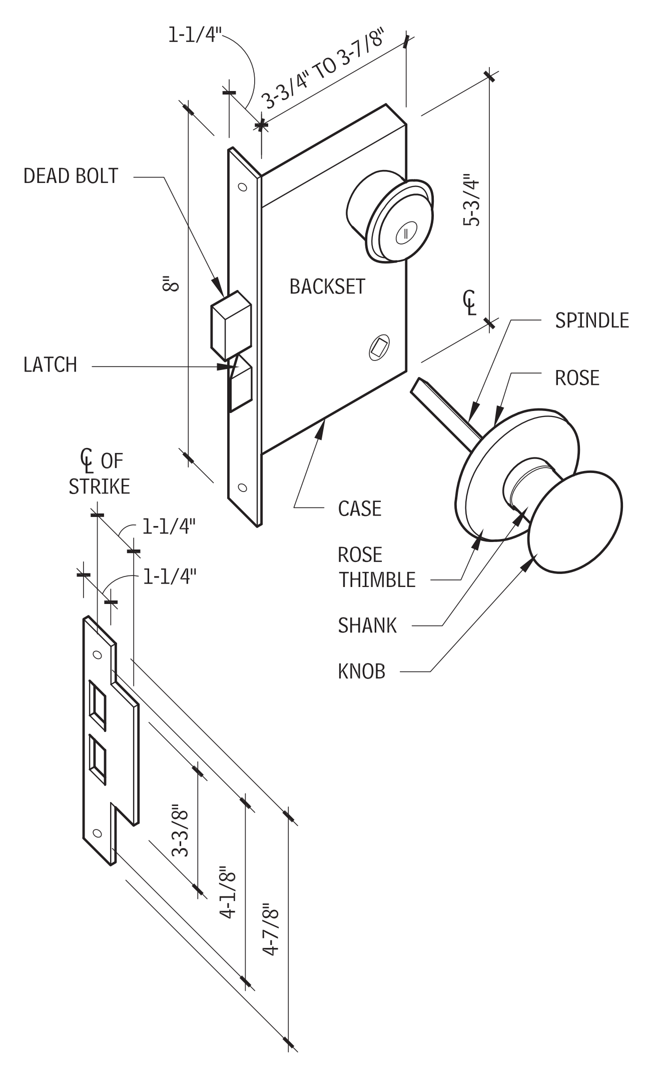


FIGURE 2.177 Mortise Lock

(Source: Courtesy of The Graphic Standards Guide to Architectural Finishes, John Wiley & Sons, Inc.)

INSTALLATION

A latchset or lockset device is typically installed on the frame or on the inactive leaf of a pair of doors, and the latchbolt and or deadbolt of the locking device is secured in the keeper of the strike. Something to be aware of is the room available to install a lockset on the edge of the door, also known as the door stile. The stile for most locksets, both mortised and bored, is approximately 5 inches. There are narrow stile latchsets and locksets available for narrower backset locksets and smaller bodies, but the typical room needed to install a lockset comfortably is 5 inches. The same hardware fits into 4 1/2 inches, but is very snug and allows no room for error or poor preparation and installation. One might not have enough room on a stile and rail door or a panel type door where the panel is recessed and allows less room for the device.

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FIGURE 2.178 Rim Lock
(Source: Courtesy of Scott J. Tobias)

Fasteners

Latchset and lockset devices are typically installed with screw fasteners, which are available for wood or metal door and frame material installation. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx.



FIGURE 2.179 Bored Lockset Being Installed on Door
(Source: Courtesy of SARGENT® Manufacturing Company)

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It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Latchset and lockset devices should be installed at locations as recommended by industry standards and codes, which are typically measured from the finished floor. Depending on the door and frame type, whether considered standard or custom metal, wood, or aluminum, standards recommend starting the first hinge from the finished floor.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the centerline of the strike on the frame installed at 40 5/16 inches.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have the centerline of the strike on the frame installed at 38 inches.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors are recommended to have the strike on the frame installed at 40 5/16 inches.

Preparations

Latchset and lockset device preparations are typically machined at the factory, including the drilling and tapping of screw holes. With doors the preparations are typically a bored or mortised cutout for the body, function holes, thumb turns, cylinders, and any handles of the device. The frame preparations are typically the cutout for the strike plate at the same location where the latchbolt and or deadbolt protrude from the lockset and door to the strike on the frame.

PANIC AND FIRE EXIT HARDWARE

Refer to Panic Hardware and Fire Exit Devices in the Inactive Leaf section of this chapter.

TWO- OR THREE-POINT LOCKSETS

Refer to Panic Hardware and Fire Exit Devices in the Inactive Leaf section of this chapter.

UNLATCH DEVICES

Please refer to Unlatch Devices in the Inactive Leaf section of this chapter.

REFERENCES

Codes and standards are available to set the minimum requirements of door openings (see the Introduction of this book for more information). Some jurisdictions have specific codes and standards, which were either modified from another existing code or created for their own use.

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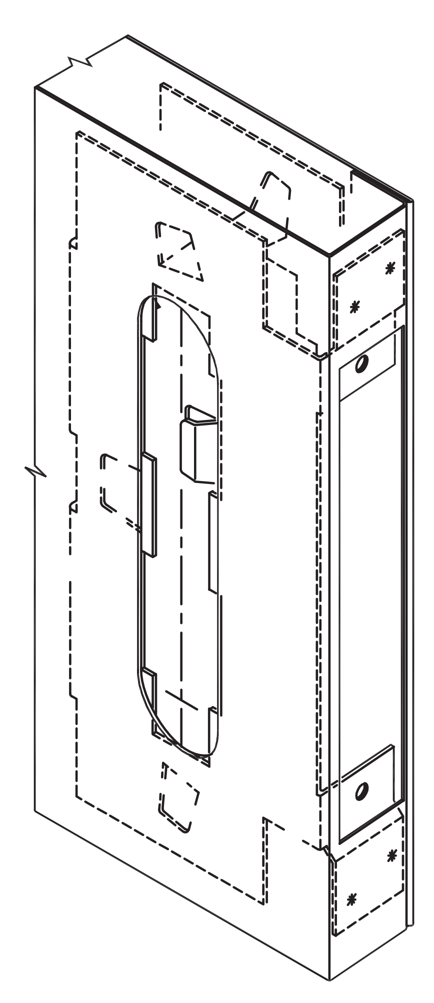


FIGURE 2.180 Mortise Lockset Preparations on Door
(Source: Courtesy of Ceco Door)

Language and section numbers can change slightly or drastically when the codes are updated. Sometimes guides are available with an outline of the changes that took place in the respective update.

CODES

Federal Emergency Management Agency (FEMA)

Following are sections of a modified or fully adopted version of FEMA, which refers specifically to windstorm-type applications:

- FEMA P320
- FEMA P361

Florida Building Code

Following are sections of a modified or fully adopted version of the Florida Building Code, which refers specifically to windstorm-type applications:

- 423.25.4 Structural Standard for Wind Loads

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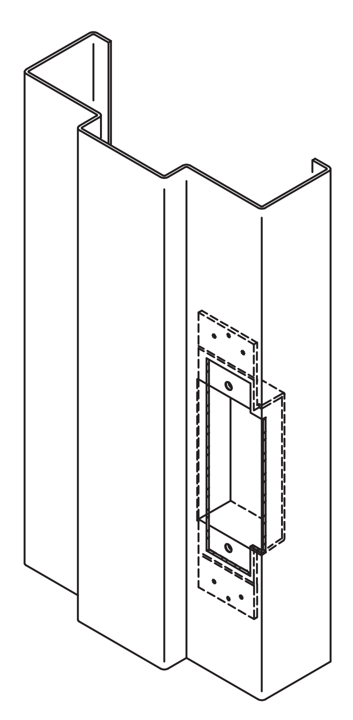


FIGURE 2.181 Mortise Strike Preparations on Door Frame
(Source: Courtesy of Ceco Door)

International Building Code (IBC)

Following are chapters of a modified or fully adopted version of the International Building Code that refer to bolts, securing devices, or door hardware in general:

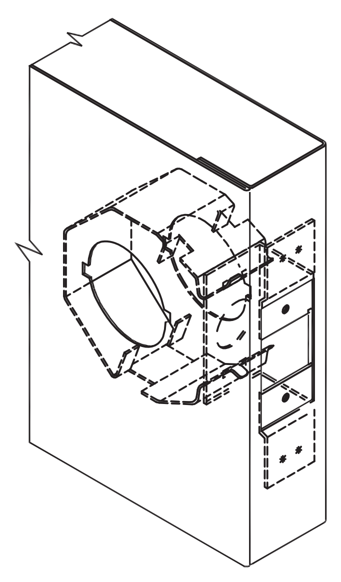


FIGURE 2.182 Bored Lockset Preparations on Door
(Source: Courtesy of Ceco Door)

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- Chapter 7: Fire and Smoke Protection Features
- Chapter 10: Means of Egress
  - Section 1008 Doors, Gates and Turnstiles
- Chapter 17: Special Inspections and Tests

International Code Council (ICC)/National Storm Shelter Association (NSSA) 500, Standard for the Design and Construction of Storm Shelters

The following are sections of a modified or fully adopted version of the ICC/NSSA 500 standard that refer bolts, securing devices or door hardware in general:

- 501.5 Door Operation
- 806.3.2.2 Door Assemblies with Glazing, Sidelights, or Transoms for Hurricane Shelters

National Fire Protection Association (NFPA) 101: Life Safety Code

The following is a chapter of a modified or fully adopted version of the NFPA 101: Life Safety Code that refers to bolts, securing devices or door hardware in general:

- Chapter 7: Means of Egress

STANDARDS

ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)

The following is a chapter of a modified or fully adopted version of the ADA Accessibility Guidelines for Buildings and Facilities, that refers to bolts, securing devices, or door hardware in general:

- Chapter 4: Accessible Routes

ASTM International (ASTM)

There are hundreds of ASTM International testing standards that are related to doors and door hardware, from material and assembly testing to installation and application testing.

Door and Hardware Institute (DHI)

Following are technical documents available for reference that refer to bolts, securing devices, or door hardware in general:

- Abbreviations and Symbols
- Basic Architectural Hardware
- Hardware for Healthcare Facilities
- Installation Guide for Doors and Hardware
- Keying Systems and Nomenclature
- Processing Hardware for Custom Aluminum Entrances
- Recommended Locations for Builders' Hardware Custom Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Flush Wood Doors
- Recommended Procedures for Processing Hardware Schedules and Templates
- Sequence and Format for the Hardware Schedule
- Tech-Talk ASD-1 Aluminum Storefront Doors
- Tech-Talk EAH Electrified Architectural Hardware
- Tech-Talk ED-1 Exit Devices

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- Tech-Talk EL-1 Electromagnetic Locks
- Tech-Talk HTL-92 Hotel/Motel Hardware and Keying
- Tech-Talk MK-1 Masterkeying
- Tech-Talk SP-1 Hardware Specification Writing

International Code Council A117.1 Accessible and Usable Buildings and Facilities, (ICC)

Following is a chapter of a modified or fully adopted version of the ICC A117.1 Accessible and Usable Buildings and Facilities that refers to bolts, securing devices, or door hardware in general:

- Chapter 4: Accessible Routes

National Fire Protection Association (NFPA)

NFPA 70, the National Electric Code has a chapter that requires the use of panic or fire exit hardware with an out-swinging door to protect the occupant of a certain sized room with a certain amount of powered equipment in the room. This will help the occupant exit the space by allowing him to push his body up against the device and door, allowing the door to unlatch and open. This might be in case of an emergency or accident where the person could not operate a handle or something that requires them to grab and turn it with their hands.

- Chapter 3: Definitions

The following are sections of a modified or fully adopted version of NFPA 80: Standard for Fire Doors and Other Opening Protectives, 2010 that refer to bolts, securing devices, or door hardware in general:

The following are chapters of a modified or fully adopted version of NFPA 80: Standard for Fire Doors and Other Opening Protectives that refer to miscellaneous items or door hardware in general:

- Chapter 5: Care and Maintenance
- Chapter 6: Swinging Doors with Builders Hardware
- Chapter 7: Swinging Doors with Fire Door Hardware
- Chapter 8: Horizontally Sliding Doors
- Chapter 9: Special-Purpose Horizontally Sliding Accordion or Folding Doors
- Chapter 16: Access Doors
- Chapter 19: Installation, Testing, and Maintenance of Fire Dampers
- Annex A: Explanatory Material

The following is a chapter of a modified or fully adopted version of NFPA 105: Standard for Smoke Door Assemblies and Other Opening Protectives that refers to miscellaneous items or door hardware in general:

- Chapter 6: Installation, Testing, and Maintenance of Smoke Dampers

The following is a chapter of a modified or fully adopted version of NFPA 252: Standard Method of Fire Tests of Door Assemblies that refers to miscellaneous items or door hardware in general:

- Chapter 5: Fire Door Assembly
- Annex B: Commentary

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American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA)

The following are standards that refer to bolts, securing devices or door hardware in general:

- ANSI/BHMA A156.2 American National Standard for Bored and Preassembled Locks and Latches
- ANSI/BHMA A156.3 American National Standard for Exit Devices
- ANSI/BHMA A156.5 American National Standard for Cylinders and Input Devices for Locks
- ANSI/BHMA A156.9 American National Standard for Cabinet Hardware
- ANSI/BHMA A156.11 American National Standard for Cabinet Locks
- ANSI/BHMA A156.12 American National Standard for Interconnected Locks
- ANSI/BHMA A156.13 American National Standard for Mortise Locks & Latches Series 1000
- ANSI/BHMA A156.18 American National Standard for Materials and Finishes
- ANSI/BHMA A156.23 American National Standard for Electromagnetic Locks
- ANSI/BHMA A156.24 American National Standard for Delayed Egress Locking Systems
- ANSI/BHMA A156.25 American National Standard for Electrified Locking Devices
- ANSI/BHMA A156.28 American National Standard for Recommended Practices for Mechanical Keying Systems
- ANSI/BHMA A156.29 American National Standard for Exit Lock, Exit Alarms, Alarms for Exit Device
- ANSI/BHMA A156.30 American National Standard for High Security Cylinders
- ANSI/BHMA A156.31 American National Standard for Electric Strikes and Frame Mounted Actuators
- ANSI/BHMA A156.32 American National Standard for Integrated Door Openings Assemblies
- ANSI/BHMA A156.36 American National Standard for Auxiliary Locks
- ANSI/BHMA A156.115 American National Standard for Hardware Preparation in Steel Doors and Steel Frames
- ANSI/BHMA A156.115W American National Standard for Hardware Preparation in Wood Doors with Wood or Steel Frames

Underwriter Laboratories (UL)

The following are UL standards that affect securing devices:

- UL 294—Access Control System Units

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Operating Trim

Now that we've hung and secured the door, the third part of the sequence is to specify operating trim. Whether there is a locking device specified or not, such as a mortise lockset or panic hardware, next we must specify or schedule a door pull, push plate, or a push-pull bar. There are many different manufacturers and variations of operating trim—there is something for just about everyone's aesthetic taste. With that said, if you want to create your own, some manufacturers have the ability to fabricate one's custom design or patterns into existing operating trim.

DOOR PULLS

Also Known As: Pulls, Pull Handles

DESCRIPTION

Door pulls are typically installed on doors that do not require latching or locking and are more for simple function and or aesthetic appeal. There are manufacturers that have locking pull options, typically used on full glass door entrances.

PROPERTIES

Finishes

Door pulls are typically available in all architectural finishes to match the balance of hardware specified, such as the hanging, securing, or controlling devices.

Grades

Door pulls are not categorized in grades but should comply with standards in Workmanship and Performance Tests as described for Product Category J400 in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

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Materials

Depending on the material, door pulls can be manufactured of aluminum, brass, ceramic, plastic, stainless steel, stone, wood, and other suitable materials.

TYPES

There are various types of door pulls available and manufacturers have created their own variations of materials, shapes, and sizes for each of the basic types. The current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim describes the recognized types.

Straight

A straight pull is a pull that is typically installed vertically on the face of a door. The ends of the pull can either curve back to attach to the door or posts might extend out of the side of the pull at various points along the vertical axis.

Offset

An offset pull is a pull that is typically installed vertically, but unlike a straight pull, the ends or mounting posts go horizontally across the door before returning to the face of a door. The ends of the pull can either curve back to attach to the door or posts might extend out of the side of the pull at various points along the vertical.



FIGURE 3.1 Straight Door Pul

(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 3.2 Straight Door Pull

(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 3.3 Straight Door Pull

(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 3.4 Straight Door Pull

(Source: Courtesy of Rockwood® Manufacturing Company)

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FIGURE 3.5 Straight Door Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

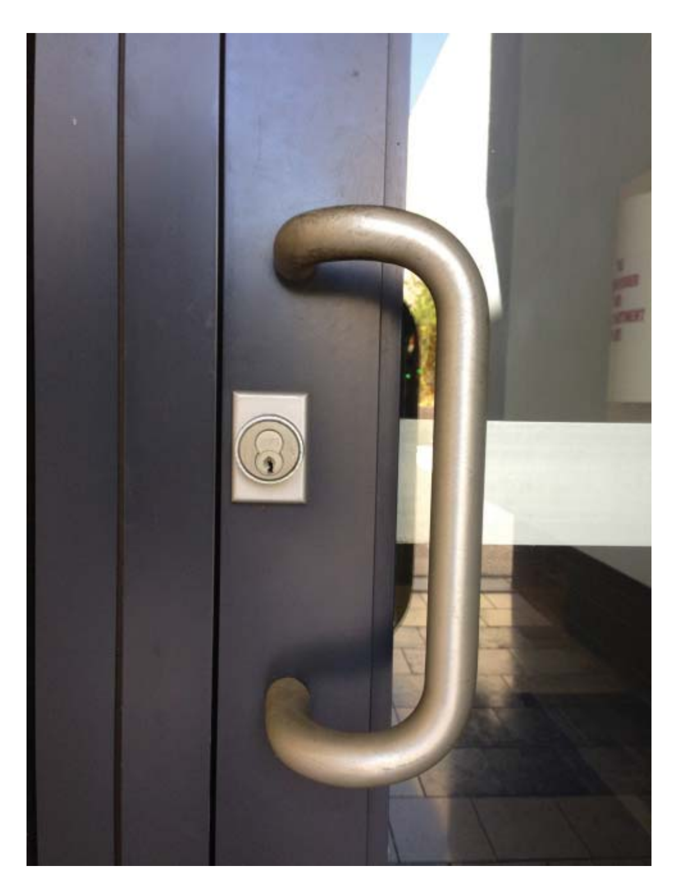


FIGURE 3.6 Offset Door Pull
(Source: Courtesy of Scott J. Tobias)

Flush

A flush pull is a pull that is typically used for sliding doors and mortised into flush with the face of a door. The pull portion of it is a recess in the face of the pull where your fingers, other body part, or device could grab the pull and open the door.



FIGURE 3.7 Flush Door Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

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There are also recessed edge pulls, which are used for pocket-type sliding doors. The doors, when open, are recessed in a pocket between two walls, and the flush pull can be popped up out of the side of the door in order to grab the pull and slide the door closed.

Drop-Ring

A drop-ring pull is a pull that can be surface-mounted or recessed in the face of a door. The pull portion is a ring that pivots off on a fixed mount away from the face of the door, allowing you to pull a door forward.

Pull Plate

A pull plate is a straight or offset pull typically vertically mounted to the center of a push plate, although it might be offset on the plate. The ends of the pull can typically curve back to attach to the push plate.

Set Option

A set option is a straight or offset pull vertically mounted to a push plate. The mounting is typically with posts that extend out of the side of the pull at various points along the vertical.

SIZES

Door pull sizes are typically specified by a manufacturer's specific model number. The model number includes the door pull diameter and length dimension. The length dimension typically describes the end-to-end dimension, no matter where the mounting takes place (at the ends or with center posts).



FIGURE 3.8 Pull Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

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For model numbers that are not standard sized or for custom door pull sizes, the custom length must be specified. Door pull installation lengths are typically referred to as center-to-center dimensions, that is, the center of the mounting posts or ends of pulls. This is not to be mistaken by the overall dimension, which might be longer than the installation dimension.

OPTIONS

Anti-Microbial Coating

Door pulls are available with an optional anti-microbial coating. The coating is a silver ion–based clear coating that helps stop the spread of bacteria. Although there are silver ions, they are not visible to the eye and a brass or bronze finish shows its true color through the coating. Silver has been used throughout history to help reduce the spread of bacteria and infection: Why not put it on doors and hardware that is touched over and over again by numerous people in a day?

Custom Sizes

There are manufacturers that will manufacture custom door pull designs, including special shapes, metal extrusions, sizes, colors, and materials. Be prepared for an additional cost for any customization different from a manufacturer's standard models, sizes, shapes, or materials.

Decorative

Some manufacturers have more decorative-looking pulls in addition to the traditional square-cornered rectangular designs.



FIGURE 3.9 Decorative Door Pull
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 3.10 Decorative Door Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

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Edges

BEVELED

Pull plates include a push plate, which has the option for beveled edges. In addition to an aesthetic preference, beveled edges are softened at the end to a 45-degree angle back to the door instead of a 90-degree square edge. It is typical for all edges of a push plate to be beveled.

SQUARE

Pull plates include a push plate, which might have the option for square edges. In addition to an aesthetic preference, square edges are a 90-degree cut back to the door. These can be dangerous as the edges can be sharp.

Engraving

Manufacturers have the ability to engrave some of their door pulls, especially if it's a flat-surfaced pull or a pull plate or set-option door pull. Engraving requests might be a room number in an office, educational, or healthcare facility, or possibly a tenant or employee name or title. Anything that would fit on the surface could be accommodated by those manufacturers that have the ability.

QUANTITIES

Door pulls are furnished in single quantities and should be specified one for each door surface required along with the proper mounting, either single (through-bolted or concealed) or back to back.

APPLICATIONS

Flush Mounted

Door pulls can be flush-mounted—typically a surface flush or drop-ring pull—or have a concealed edge pull, typically used on pocket sliding doors.

Surface Mounted

Door pulls can be either surface-mounted on one side of a door with through-bolts (bolts that are visible on the other side of the door) or concealed-mounted, in which case the pull is not visible on the other side of the door. Pair door pulls are typically concealed-mounted and aligned back to back to each other.

INSTALLATION

Door pulls can be installed on one or both leaves of a single door or on a pair of doors and can be installed on one side or both as a single or back-to-back mounting.

Fasteners

Door pulls are typically installed with screw fasteners, which are available for installation on wood, metal, or glass door materials. A pull-plate door pull has countersunk screw holes around the perimeter, which should comply with ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

BACK TO BACK

Back-to-back mounting is typically installing two identical pulls mounted to each other through the same holes in the door using the same fasteners.

CONCEALED

Concealed mounting is typically a one-sided installation with a mounting plate or fastener. The pull is recessed and attached to the fasteners, then locked in place with a set screw, which is typically out of sight and underneath the pull end faces.

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SELF-ADHESIVE

Self-adhesive double-faced tape is available from some manufacturers and might most typically be used with a pull-plate door pull. If self-adhesive tape is used, the plate does not have any screw holes, as with a typical installation.

THROUGH-BOLT

Through-bolt fasteners are visible on the other side of the door and connect to the pull. Standard bolt heads or decorative bolt heads are available from some manufacturers.

Back-to-back fasteners are for pulls that are installed at the same location on both sides of a door. The fasteners are typically installed through the door and the pulls sit on top of the fasteners and are secured similarly to concealed fasteners with set screws on both sides of the door.

Special screw heads are available as an option, including security, security stud, and torx. It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer, unless recommended by the manufacturer.

Locations

Door pulls should be installed at locations as recommended by industry standards and codes, depending on the door type, which are typically measured from the finished floor.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have the centerline of a door pull installed at 42 inches above the finished floor.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors and frames are recommended to have the centerline of a door pull installed at 42 inches above the finished floor.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the centerline of a door pull installed at 42 inches above the finished floor.

Preparations

Door pull preparations could be machined at the factory or in the field, including the drilling and tapping of screw holes. With surface-mounted pulls, the screw holes are typically cut in the field, while flush pulls might be prepared at the factory as a preference due to the precision required for proper operation.

PUSH PLATES

DESCRIPTION

Push plates are typically installed on doors that do not require latching or locking and are more for simple function and/or aesthetic appeal. Surface applied, push plates come in many shapes such as rectangular/square edged and round/radius edged, and some manufacturers offer custom form shapes and edges.

PROPERTIES

Finishes

Push plates are typically available in all architectural finishes to match the balance of hardware specified such as the hanging, securing, or controlling devices.

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Grades

Push plates are not categorized in grades but should comply with standards in Workmanship and Performance Tests as described for Product Category J400 in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

Materials

Push plates can be manufactured of aluminum, brass, ceramic, plastic, rubber, stainless steel, stone, wood, and other suitable materials.

TYPES

There are various types of push plates available, and manufacturers have created their own variations of materials, shapes, and sizes for each of the basic types. The current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim describes each as related to Product Category J300.

Flat Plate

A flat-plate push plate is typically installed vertically on the face of a door but can be installed in different configurations on the door. The shape can be square edged, rounded, or a custom shape if available from the manufacturer.

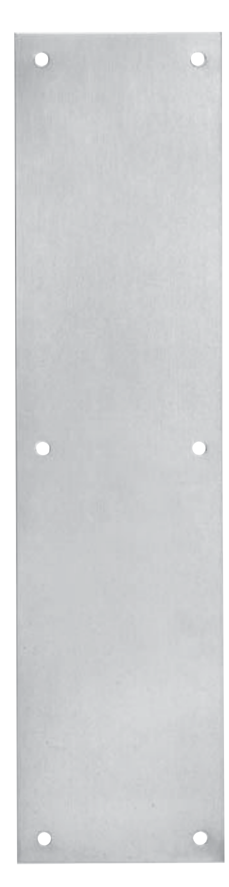


FIGURE 3.11 Push Plate

(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 3.12 Push Plate

(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 3.13 Push Plate

(Source: Courtesy of Rockwood® Manufacturing Company)

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Cold Forged

A cold-forged push plate is typically a standard or carbon alloy steel, which is forced into a die to create the shape, rather than stamping it out of metal like a flat push plate. Although typically installed vertically, the plate can be installed in different configurations on the door.

Push-Pull Plate

A push-pull plate is a push plate that has a pull projecting off the bottom end of the plate. The plate must be forged in order to get this shape to have any strength.

SIZES

Push plate sizes are typically specified by a manufacturer's specific model number. The model number includes the push plate height, size, and thickness. It also includes any pull information such as diameter and center-to-center dimension if a pull plate is being used.

OPTIONS

Anti-Microbial Coating

Push plates are available with an optional anti-microbial coating. The coating is a silver ion–based clear coating that helps stop the spread of bacteria. Although there are silver ions, they are not visible to the eye and a brass or bronze finish shows its true color through the coating. Silver has been used throughout history to help reduce the spread of bacteria and infection: Why not put it on doors and hardware that is touched over and over again by numerous people in a day?



FIGURE 3.14 Push-Pull Plate
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 3.15 Push-Pull Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

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Custom Sizes

There are manufacturers that will manufacture custom push plates, including special shapes, metal extrusions, sizes, colors, and materials. Be prepared for an additional cost for any customization of a manufacturer's standard models, sizes, shapes, or materials.

Decorative

Some manufacturers have decorative push plates in addition to the traditional square-cornered rectangular designs.

Edges

BEVELED

Push plates have the option for beveled edges. In addition to being an aesthetic preference, beveled edges are softened at the end to a 45-degree angle back to the door instead of being a 90-degree square edge, which is safer than a square edge. It is typical for all edges of a push plate to be beveled.

SQUARE

Push plates might have the option for square edges. Although it might be an aesthetic preference, square edges have a 90-degree cut back to the door, which can dangerous due to their sharpness.



FIGURE 3.16 Decorative Push Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

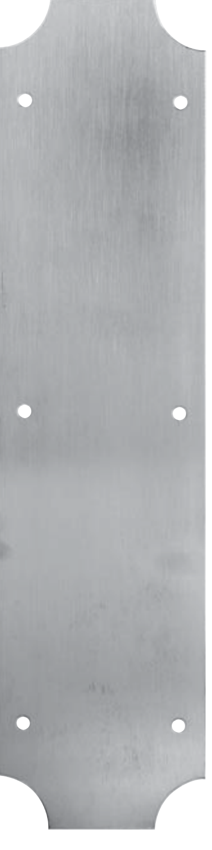


FIGURE 3.17 Decorative Push Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

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Engraving

Manufacturers have the ability to engrave some of their push plates. Engraving requests might include a room number in an office, educational, or healthcare facility, or possibly a tenant's or employee's name or title. Anything that will fit on the surface could be accommodated by those manufacturers that have the ability to do engraving.

QUANTITIES

Push plates are furnished in single quantities and should be specified one for each door surface required.

APPLICATIONS

Surface Mounted

Push plates are typically surface-mounted, on either one side of a single acting door or on a door that swings in one direction. Push plates can also be mounted on both sides of a double-acting door or on a door that swings in both directions such as a restaurant kitchen door.

INSTALLATION

Fasteners

Push plates are typically installed with screw fasteners, which are available for installation on wood or metal door materials. A push plate typically has countersunk screw holes around the perimeter, which should comply with ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

SELF-ADHESIVE

Self-adhesive double-faced tape is available by some manufacturers. If self-adhesive tape is used, the push plate typically does not have any screw holes, as with a typical installation.

Locations

Push plates should be installed at locations as recommended by industry standards and codes, depending on the door type, which are typically measured from the finished floor.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have the centerline of a push plate installed at 46 inches above the finished floor.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors and frames are recommended to have the centerline of a push plate installed at 45 inches above the finished floor.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the centerline of a push plate installed at 45 inches above the finished floor.

Preparations

Push plate door preparations are typically done in the field, as they are surface applied, including the drilling and tapping of screw holes.

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PUSH AND PULL BARS

Also Known As: Push-Pull Bars Description

Push and pull bars are typically installed on doors that do not require latching or locking and are used more for simple function and or aesthetic appeal.

PROPERTIES

Finishes

Push-pull bars are typically available in all architectural finishes to match the balance of hardware specified such as the hanging, securing, or controlling devices.

Grades

Push-pull bars are not categorized in grades but should comply with standards in Workmanship and Performance Tests as described for Product Category J500 in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

Materials

Push-pull bars can be manufactured in aluminum, brass, ceramics, plastics, stainless steel, stone, wood, and other suitable materials.

TYPES

There are various types of push-pull bars available and manufacturers have created their own variations of materials, shapes, and sizes for each of the basic types. The current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim describes each as related to Product Category J500.

Bar Set

This bar set option uses a single push bar horizontally across the push side of the door and a straight pull installed vertically on the pull side of a door. On what would be the latching end of the door, the push bar mount on the push side of the door attaches to the top door pull mount as on the pull side of the door with back-to-back mounting. The bottom of the door pull mount attaches with either a through-bolt or concealed mounting.



FIGURE 3.18 Bar Set
(Source: Courtesy of Rockwood® Manufacturing Company)

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Push Bar

A single push bar is installed horizontally across the push side of a door. The ends can be mounted with through-bolts or concealed mounting.

SIZES

Push and pull bar sizes are typically specified by a manufacturer's specific model number. The model number includes the door pull diameter and length dimension. The length dimension typically describes the end-to-end dimension, no matter where the mounting takes place (at the ends or with center posts). For model numbers that are not standard sized or for custom door pull sizes, the custom length needs to be specified.



FIGURE 3.19 Push Bar
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 3.20 Push Bar
(Source: Courtesy of Rockwood® Manufacturing Company)

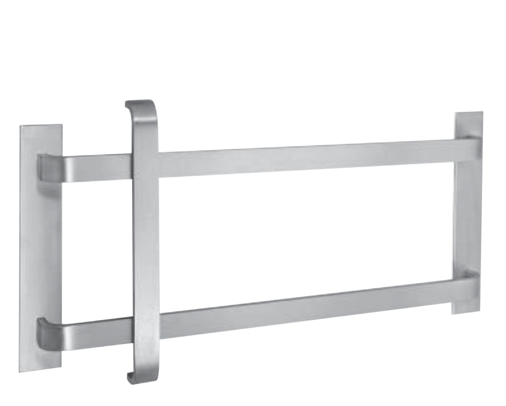


FIGURE 3.21 Push Bar
(Source: Courtesy of Rockwood® Manufacturing Company)

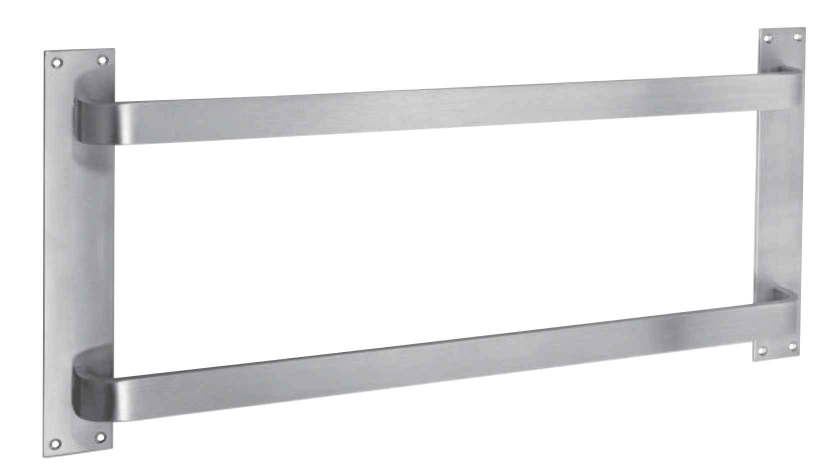


FIGURE 3.22 Push Bar
(Source: Courtesy of Rockwood® Manufacturing Company)

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OPTIONS

Anti-Microbial Coating

Push and pull bars are available with an optional anti-microbial coating. The coating is a silver ion–based clear coating that helps stop the spread of bacteria. Although there are silver ions, they are not visible to the eye and a brass or bronze finish shows its true color through the coating. Silver has been used throughout history to help reduce the spread of bacteria and infection: Why not put it on doors and hardware that is touched over and over again by numerous different people in a day?

Custom Sizes

There are manufacturers that will manufacture custom push-pull bars, including special shapes, metal extrusions, sizes, colors, and materials. Be prepared for an additional cost for any customization of a manufacturer's standard models, sizes, shapes, or materials.

Engraving

Manufacturers have the ability to engrave some of their push and pull bars, especially if they have a flat surface. Engraving requests might be a room number in an office, educational, or healthcare facility, or possibly a tenant's or employee's name or title. Anything that would fit on the surface can be accommodated by those manufacturers that have the ability to engrave.

QUANTITIES

Push-pull bars are furnished as a single push bar or in sets that include a push bar and door pull.

APPLICATIONS

Surface Mounted

Push and pull bars can be surface-mounted on the face of both sides of the door.

INSTALLATION

Push-pull bars can be installed as surface-mounted on the push side of a door or on both sides with a door pull on the pull side of the door. A pair of doors has the same hardware on both leaves.

Fasteners

Push and pull bars are typically installed with screw fasteners, which are available for installation on wood, metal, or glass doors.

BACK TO BACK

Back-to-back mounting can be used for the top bolt of the door pull, connected to the door swing side of the push bar, in a bar set option installation.

CONCEALED

Concealed mounting can be used to install the bottom bolt of the door pull in a bar set option installation.

THROUGH-BOLT

Through-bolt mounting can be used to install the bottom bolt of the door pull, if it is a bar set option installation. Decorative through-bolts might be available, depending on the manufacturer.

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Locations

Push-pull bars should be installed at locations as recommended by industry standards and codes, depending on the door type, which are typically measured from the finished floor.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have the centerline of a push and pull bar installed at 42 inches above the finished floor.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors and frames are recommended to have the centerline of a door pull installed at 42 inches above the finished floor.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the centerline of a door pull installed at 42 inches above the finished floor.

Preparations

Push and pull bar preparations can be machined at the factory but are more likely to be completed in the field by the installer, including the drilling and tapping of screw holes.

REFERENCES

Codes and standards are available to set the minimum requirements of door openings (see the Introduction of this book for more information). Some jurisdictions have specific codes and standards, which were either modified from another existing code or created for their own use.

Language and section numbers can change slightly or drastically when the codes are updated. Look for an outline, if available, of the changes that took place in the respective update.

CODES

International Building Code (IBC)

The following are chapters of a modified or fully adopted version of the International Building Code, that refer to operating trim or door hardware in general:

- Chapter 7: Fire and Smoke Protection Features
- Chapter 10: Means of Egress
- Chapter 17: Special Inspections and Tests

National Fire Protection Association (NFPA) 101: Life Safety Code

The following is a chapter of a modified or fully adopted version of the NFPA 101: Life Safety Code that refers to operating trim or door hardware in general:

- Chapter 7: Means of Egress

STANDARDS

ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)

The following is a chapter of a modified or fully adopted version of the ADA Accessibility Guidelines for Buildings and Facilities, that refers to operating trim or door hardware in general:

- Chapter 4: Accessible Routes

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ASTM International (ASTM)

There are hundreds of ASTM International testing standards that are related to doors and door hardware, from material and assembly testing to installation and application testing.

Door and Hardware Institute (DHI)

The following are technical documents available for reference that refer to door push-pull bar or operating trim in general:

- Abbreviations and Symbols
- Basic Architectural Hardware
- Hardware for Healthcare Facilities
- Installation Guide for Doors and Hardware
- Processing Hardware for Custom Aluminum Entrances
- Recommended Locations for Builders' Hardware Custom Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Flush Wood Doors
- Recommended Procedures for Processing Hardware Schedules and Templates
- Sequence and Format for the Hardware Schedule
- Tech-Talk ASD-1 Aluminum Storefront Doors
- Tech-Talk SP-1 Hardware Specification Writing

International Code Council A117.1 Accessible and Usable Buildings and Facilities, (ICC)

The following is a chapter of a modified or fully adopted version of the ICC A117.1 Accessible and Usable Buildings and Facilities that refers to operating trim or door hardware in general:

- Chapter 4: Accessible Routes

National Fire Protection Association (NFPA)

The following are chapters of a modified or fully adopted version of NFPA 80: Standard for Fire Doors and Other Opening Protectives that refer to operating trim or door hardware in general:

- Chapter 5: Care and Maintenance
- Chapter 6: Swinging Doors with Builders Hardware
- Chapter 7: Swinging Doors with Fire Door Hardware
- Chapter 8: Horizontally Sliding Doors
- Chapter 9: Special-Purpose Horizontally Sliding Accordion or Folding Doors
- Chapter 16: Access Doors
- Chapter 19: Installation, Testing, and Maintenance of Fire Dampers
- Annex A: Explanatory Material

The following is a chapter of a modified or fully adopted version of NFPA 105: Standard for Smoke Door Assemblies and Other Opening Protectives that refers to operating trim or door hardware in general:

- Chapter 6: Installation, Testing, and Maintenance of Smoke Dampers

The following is a chapter of a modified or fully adopted version of NFPA 252: Standard Method of Fire Tests of Door Assemblies that refers to operating trim or door hardware in general:

- Chapter 5: Fire Door Assembly
- Annex B: Commentary

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American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA)

The following are standards that refer to operating trim or door hardware in general:

- ANSI/BHMA A156.6 American National Standard for Architectural Door Trim
- ANSI/BHMA A156.18 American National Standard for Materials and Finishes
- ANSI/BHMA A156.115 American National Standard for Preparation in Steel Door and Steel Frames
- ANSI/BHMA A156.115W American National Standard for Preparation in Wood Doors with Wood or Steel Frames

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Accessories for Pairs of Doors Only

If we are working with a pair of doors, the next step in the sequence is to include accessories for pairs of doors, including coordinators and carry bars. These devices help us coordinate the closing and opening of certain pair of door applications.

COORDINATOR

Also Known As: Door Coordinator

DESCRIPTION

As its name suggests, this device coordinates the closing sequence of a pair of doors with an active and inactive door using automatic flushbolts. When opened and then released, if the active door closes before the inactive, the automatic flushbolts on the inactive leaf will not secure properly. If the inactive leaf is not secured, that would prohibit the active leaf form securing properly, in reality leaving both doors unsecure and not in compliance with any fire codes that might be required for that opening.

A coordinator is not one of the more aesthetically pleasing devices, but it serves an important function by meeting codes requiring both leaves of a pair of doors to latch.

PROPERTIES

Finishes

Coordinators are typically available in a primed finish, intended to be painted the same color as the door frame in the field. There are some manufacturers that offer limited finishes.

Materials

Depending on the type and in addition to the springs and metal parts inside the device, coordinators are available manufactured with aluminum, brass, and steel metals.

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TYPES

Although all work toward the same end result in coordinating the closing sequence of a pair of doors, there are various types of coordinators available with different applications for each.

Bar

A bar coordinator is a rectangular tube-like device that has springs and mechanisms inside that operate two triggers at either end of the device. If the active door closes faster than the inactive one, the active door trigger holds the active door until the inactive door passes and depresses the inactive door trigger. Once the inactive door trigger is depressed, the active door trigger releases and allows the active door to close. This device might have options to work with vertical rod exit devices, which typically latch in the same location where the bar coordinator is installed. Factory cutouts are coordinated for the vertical rod exit device it will work with and cut into the bar at the factory so the latches have someplace to latch.

Gravity

Although similar in function, a gravity coordinator is quite different in operation and appearance from the bar coordinator. The gravity coordinator is operated with a roller-stop and lift mechanism that pivots on a base plate that is attached to the face of a door frame and relies on gravity to operate. If the active door closes faster than the inactive, the active door roller stop holds the active door until the inactive door passes and rotates the lift arm, which raises the roller stop above the active door allowing it to close.

Universal

With a body and installation similar to a bar coordinator, the universal coordinator has two arms that extend and retract out of the face with rollers at the end of each. When the doors move to the open position, the arms of the coordinator extend. If the active door closes faster than the inactive one, the active door roller stop arm holds the active door until the inactive door passes and depresses the inactive roller stop arm, which releases the active roller stop arm allowing the active door to close. The universal coordinator does not typically have the option to allow vertical rod exit devices to latch.

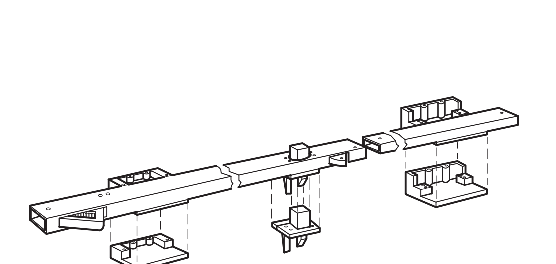


FIGURE 4.1 Bar Door Coordinator
(Source: Courtesy of Rockwood® Manufacturing Company)

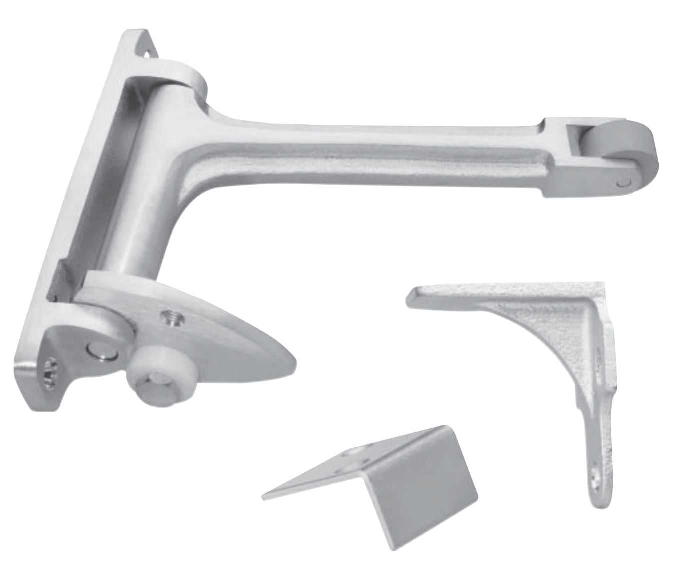


FIGURE 4.2 Gravity Door Coordinator
(Source: Courtesy of Rockwood® Manufacturing Company)

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FIGURE 4.3 Universal Door Coordinator
(Source: Courtesy of Rockwood® Manufacturing Company)

SIZES

Bar

Bar coordinators are typically available in various sizes to accommodate various door widths. Manufacturers typically provide recommendations for minimum and maximum door width sizes.

Gravity

The gravity coordinator is available in one size but sometimes with varying roller stop arm lengths to accommodate different door width sizes. Manufacturers typically provide recommendations for minimum and maximum door width sizes.

Universal

Universal coordinators are typically available in one size to accommodate up to certain door widths. Manufacturers typically provide recommendations for minimum and maximum door width sizes.

OPTIONS

Filler Bar

Filler bars are available for bar coordinator installations. Most bar coordinators will not fill the entire width of the rabbet on the head of a frame where it is installed. Therefore, manufacturers offer matching filler bars, which are the same shape, size, and finish as the bar coordinator. Filler bars come in certain widths and can be cut in the field to fill any size space.

Mounting Brackets

Mounting brackets are available in different sizes and configurations for the installation of bar coordinators that have conflicting stop mounted hardware. Such hardware might be a parallel arm closer or surface vertical rod exit device strike.

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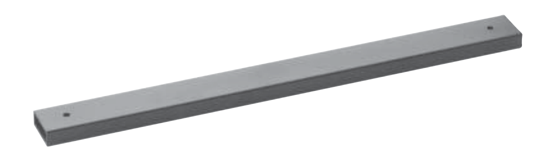


FIGURE 4.4 Coordinator Filler Bar
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 4.5 Coordinator Mounting Brackets
(Source: Courtesy of Rockwood® Manufacturing Company)

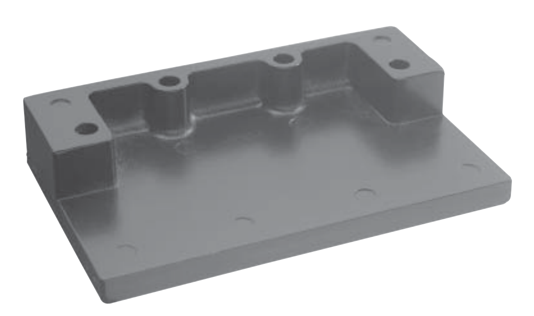


FIGURE 4.6 Coordinator Mounting Brackets
(Source: Courtesy of Rockwood® Manufacturing Company)

QUANTITIES

Any type of coordinator is typically furnished in single quantities for each pair of doors. Mounting brackets for bar coordinators are typically furnished in sets of two, one for each end of the bar coordinator, for each pair of doors.

APPLICATIONS

Face Mounted

Gravity coordinators are installed at the center on the face of a frame above the doorway.

Rabbet Mounted

Bar and universal coordinators are installed on the door side rabbet of a double rabbetted frame at the head.

INSTALLATION

Gravity coordinators are installed at the center on the face of a frame above the doorway while bar and universal coordinators are installed on the door side rabbet of a double rabbetted frame at the head. The bar and universal coordinators are typically flush up against the stop of the frame, with the intent of giving the appearance of a single rabbetted frame.

Due to the bar coordinator's mounting position, there may be conflicts with other hardware to be installed such as door closers and vertical rod exit device latches. In these circumstances, another item that might be required is the coordinator mounting brackets.

Fasteners

Coordinators are typically installed with self-tapping screw fasteners, which can be installed on various door frame materials.

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Locations

BAR

Bar coordinators are installed on the door side rabbet of a double-rabbetted frame at the head and flush against the stop of the frame with the intent of giving the frame a single-rabbetted frame appearance.

GRAVITY

Gravity coordinators are installed at the center on the face of a frame above the doorway and hang off of the face of the frame.

UNIVERSAL

Universal coordinators are installed on the door side rabbet of a double-rabbetted frame at the head. They are installed flush against the stop of the frame with the intent of giving the frame a single-rabbetted frame appearance.

Preparations

Coordinator frame preparations are not necessary and are simply screwed directly to the head of the door frame rabbet or face of the door frame.

CARRY BAR

Also Known As: Carry Open Bar, Door Carry Bar

DESCRIPTION

A carry bar is used when the possibility exists that an inactive door can open before an active door. An application that might require this device is a mortise lock exit device on the active leaf and vertical rod



FIGURE 4.7 Carry Bar
(Source: Courtesy of Scott J. Tobias)

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exit device on the inactive one. If the vertical rod exit device door is opened first, the carry bar pushes the active door out far enough so that it can engage with the coordinator and for a proper closing sequence. If the vertical rod exit device door does not close first, the mortise lock exit device door will not latch properly, prohibiting both leaves from latching at all.

PROPERTIES

Finishes

Coordinators are typically available with limited architectural finishes, most of the time available with a gray prime coat for painting in the field, typically with the same color as the door and frame.

Materials

Depending on the manufacturer, carry bars are available manufactured with brass and steel metals and some with nylon rollers to assist with the opening of the active door.

TYPES

Although they are manufactured slightly differently, there is really only one type of carry bar. Most are manufactured out of a metal that is fixed to the inactive door, with either a metal or nylon roller at the other end, which are used to assist with the opening of the active door.

SIZES

Carry bars are very small, no more than 2 inches by 3 inches on either side.

OPTIONS

Adjustment

The only option available for some carry bars is an adjustment to the length of the arm. The adjustment allows for use with various door sizes and gives the device an extra 1/2 inch extension if necessary.

QUANTITIES

Carry bars are typically furnished in single quantities for each pair of doors.

APPLICATIONS

Surface Mounted

Carry bars are surface-mounted on the push side face of the inactive door.

INSTALLATION

Fasteners

Carry bars are typically installed with through-bolts in order to give the device a more secure installation to the face of the door.

Locations

Carry bars are typically located on the push side and near the top edge of the inactive leaf of a pair of doors.

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Preparations

Carry bar preparations are not necessary and they are simply through-bolted to the edge the active door of a pair of doors in the field.

SUBSTITUTIONS

If product substitution requests are allowed for door hardware, it is typically specified in Division 1 of the project specifications. The substitution request requirements typically request product data and proof that the requested substitute will meet the same grade, function, application, aesthetic, and quality of the originally specified product.

Sometimes, to be more competitive on a bid, a less durable or lower-quality carry bar substitution might be offered or take place without much or any knowledge at all. A cost credit might be offered, and sometimes it might not be when the lesser quality substitution takes place. A lesser quality carry bar substitution might result in the failure of the installation, causing a necessary replacement of the product. This is also less sustainable since more parts are needed more frequently due to the premature replacement.

REFERENCES

Codes and standards are available to set the minimum requirements of door openings (see the Introduction of this book for more information). Some jurisdictions have specific codes and standards, which were either modified from another existing code or created for their own use.

Language and section numbers can change slightly or drastically when the codes are updated. Look for an outline, if available, of the changes that took place in the respective update.

CODES

International Building Code (IBC)

The following are chapters of a modified or fully adopted version of the International Building Code that refer to accessories for pairs of doors or door hardware in general:

- Chapter 7: Fire and Smoke Protection Features
- Chapter 10: Means of Egress

National Fire Protection Association (NFPA) 101: Life Safety Code

The following is a chapter of a modified or fully adopted version of the NFPA 101: Life Safety Code, which refers to accessories for pairs of doors or door hardware in general:

- Chapter 7 Means of Egress

STANDARDS

ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)

The following is a chapter of a modified or fully adopted version of the ADA Accessibility Guidelines for Buildings and Facilities, which refers to accessories for pairs of doors or door hardware in general:

- Chapter 4: Accessible Routes

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ASTM International (ASTM)

There are hundreds of ASTM International testing standards that are related to doors and door hardware, from material and assembly testing to installation and application testing.

Door and Hardware Institute (DHI)

The following are technical documents available for reference that refer to accessories for pairs of doors or door hardware in general:

- Abbreviations and Symbols
- Basic Architectural Hardware
- Hardware for Healthcare Facilities
- Installation Guide for Doors and Hardware
- Processing Hardware for Custom Aluminum Entrances
- Recommended Locations for Builders' Hardware Custom Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Flush Wood Doors
- Recommended Procedures for Processing Hardware Schedules and Templates
- Sequence and Format for the Hardware Schedule
- Tech-Talk ASD-1 Aluminum Storefront Doors
- Tech-Talk SP-1 Hardware Specification Writing

International Code Council A117.1 Accessible and Usable Buildings and Facilities, (ICC)

The following is a chapter of a modified or fully adopted version of the ICC A117.1 Accessible and Usable Buildings and Facilities, which refers to accessories for pairs of doors or door hardware in general:

- Chapter 4: Accessible Routes

National Fire Protection Association (NFPA)

The following are chapters of a modified or fully adopted version of NFPA 80: Standard for Fire Doors and Other Opening Protectives, which refer to accessories for pairs of doors or door hardware in general:

- Chapter 5: Care and Maintenance
- Chapter 6: Swinging Doors with Builders Hardware
- Chapter 7: Swinging Doors with Fire Door Hardware
- Chapter 8: Horizontally Sliding Doors
- Chapter 9: Special-Purpose Horizontally Sliding Accordion or Folding Doors
- Chapter 16: Access Doors
- Chapter 19: Installation, Testing, and Maintenance of Fire Dampers
- Annex A: Explanatory Material

The following is a chapter of a modified or fully adopted version of NFPA 105: Standard for Smoke Door Assemblies and Other Opening Protectives, which refers to miscellaneous items or door hardware in general:

- Chapter 6: Installation, Testing, and Maintenance of Smoke Dampers

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The following is a chapter of a modified or fully adopted version of NFPA 252: Standard Method of Fire Tests of Door Assemblies, which refers to miscellaneous items or door hardware in general:

- Chapter 5: Fire Door Assembly
- Annex B: Commentary

American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA)

The following are standards that refer to accessories for pairs of doors or door hardware in general:

ANSI/BHMA A156.18 American National Standard for Materials and Finishes

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Closing and Control Devices

Closing and controlling a door is important for many reasons, including the protection of lives and materials, traffic control, security, and energy efficiency.

A closing device, also known as a door closer, is manufactured as different types of fixtures, depending on the function and application of the opening. Surface-mounted, concealed overhead in the door or frame, and concealed in the floor versions are available for different applications with various options for each.

A controlling device, also known as a door stop, is also manufactured as different types of mechanisms, including floor, wall, and overhead, in order to protect the door, frame, hardware, and surrounding conditions. Sometimes a closing device is erroneously used as a controlling device, which it is not intended to be. Misusing the closing device shortens the life of the opening because of having to maintain and adjust the door, frame, and hardware time and time again.

Depending on the local codes and authority having jurisdiction, some door openings might have certain considerations in regard to their closing requirements if there are sprinklers installed on either side of the opening.

DOOR CLOSER

Also Known As: Closing Device, Closer

DESCRIPTION

A door closer is intended to close a door automatically after it has been opened. This is a manual device that works with springs and or hydraulic fluid to create the proper tension and pressure to close the door as intended. A door might need to close for numerous reasons, such as for security purposes, because of fire protection codes, for energy efficiency, or simply as a preference. With that said, door closers have many options, one of which is the ability to manually hold the door in the open position,

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but there are certain restrictions with doing that if the door is fire rated, as codes state that all fire rated doors must close automatically at the time of a fire.

PROPERTIES

Closers are typically furnished with a closer body, which is installed at the head of a door and frame. There are other types of closing devices such as spring hinges and floor closers, which are covered in Chapter 1, Hanging Devices.

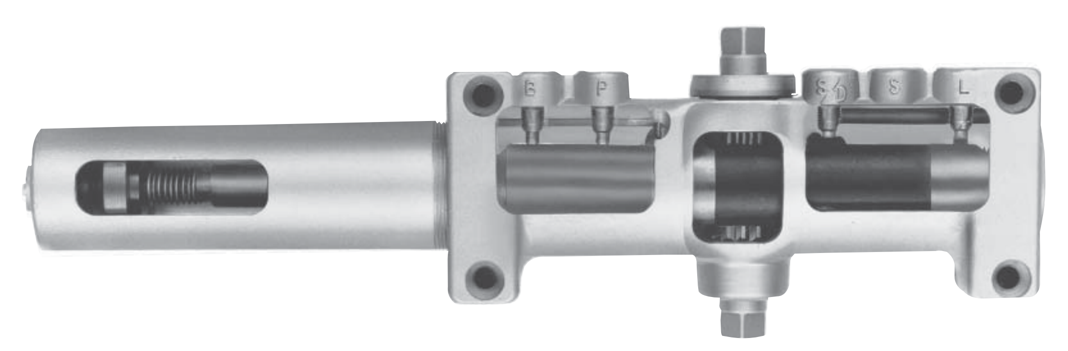


FIGURE 5.1 Surface-Mounted Door Closer Body
(Source: Courtesy of Norton® Door Controls)

Finishes

Closer bodies do not have finishes as they are covered by a metal or plastic cover. Plastic covers are typically furnished with a painted or powder-coated architectural finish to match as closely as possible the other hardware installed on the door such as the locking device. Powder coating is a process of baking on the paint, while metal covers allow for the matching of most standard architectural finishes, but at an additional cost.

Grades

Door closers are graded with grades 1, 2, or 3 depending on ANSI/BHMA test procedures. Such tests include cycle- and various valve-testing to meet minimum levels. Minimum levels, for example, for a surface or concealed in door, cycle testing for a grade 1 closer is 1 million cycles and 100,000 cycles with the backcheck valve control functional.

Materials

The internal parts and covers of door closers are manufactured from various metals and plastic, depending on the manufacturer. The arms are manufactured from brass, bronze, stainless steel, or steel, depending on their application and fire rated door opening requirements.

SPRING

A spring is typically found to be part of a door closer, working together with hydraulic valves that require a lubricant to operate. The spring is wound and has tension in the same direction as the door swing, which helps with efficiency and operation of the door.

STOPS

Some door closers have built-in stops, which hard-stop the door at a set degree of opening. The stop function is typically manufactured into the closer arm and the opening degree is typically limited and depends on the application and manufacturer's availability.

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VALVES

Closers are manufactured with various valves to assist with optimizing the closing and latching speeds and forces. These valves act in cycles of the door opening and closing.

Backcheck

Backcheck valves allow for adjustment to the opening force past about 65 degrees of the door in the open position to give the door less resistance, making it easier to push open.

Delayed Action

Delayed action valves are available to delay the initial closing of the door. This will allow something that moves slower than average more time to move through the opening without the door pushing right up behind it.

Latch Speed

Latch speed valves allow for adjustment to the latching speed cycle. This would be the speed once past the closing speed cycle and give the door enough force and power to clear any of the locking device latches or any other surrounding conditions that might affect the closing, such as gaskets around the perimeter of the door.

Sweep Speed

Sweep speed valves allow for adjustment to the closing speed cycle. This would be the speed once initially released if the device has no Delayed Action option or once the delayed action has completed, and would affect the closing up until about 15 degrees of the closed position.

TYPES

Door closers are available to suit various applications and aesthetics, including heavy-duty devices for high frequency–use doors and an old fashioned “pot belly” closer.

Surface Mounted

PARALLEL ARM

The parallel arm surface-mounted door closer mounts on the push side of the door and the arm is parallel with the door, making it less susceptible to vandalism or hanging off the arm if the closer has

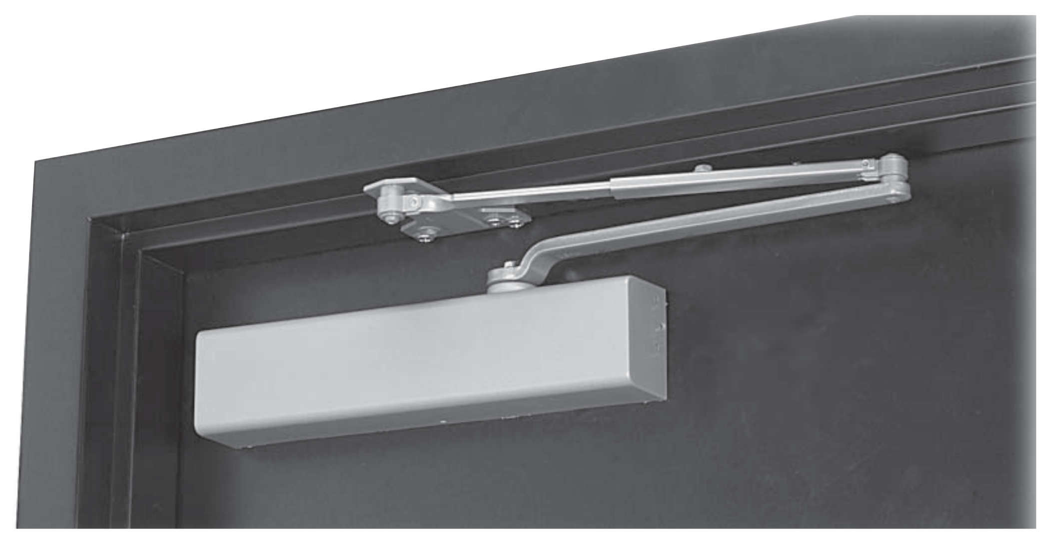


FIGURE 5.2 Parallel Arm Door Closer
(Source: Courtesy of Norton® Door Controls)

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to be mounted on the push side of the door. This type of installation is less efficient than the regular arm installation due to the configuration and requires more tension in the spring to close effectively.

POT BELLY

Resembling a pot belly, the closer of the same name is a surface-mounted closer that is more rounded than square and protrudes out in front of the door.

REGULAR ARM

The regular arm surface-mounted door closer is always mounted on the pull side of the door, with the arm protruding off the face of the door and frame. Regular arm installation is the most efficient of the surface-mounted installations due to the configuration and force of the arm.

TOP JAMB

A top-jamb-mounted surface-mounted door closer body is mounted on the frame instead of the door, where the arm protrudes off the face of the frame door similar to regular arm installation. This application is typically used when the closer is mounted on the door's push side when there is a reveal. If the

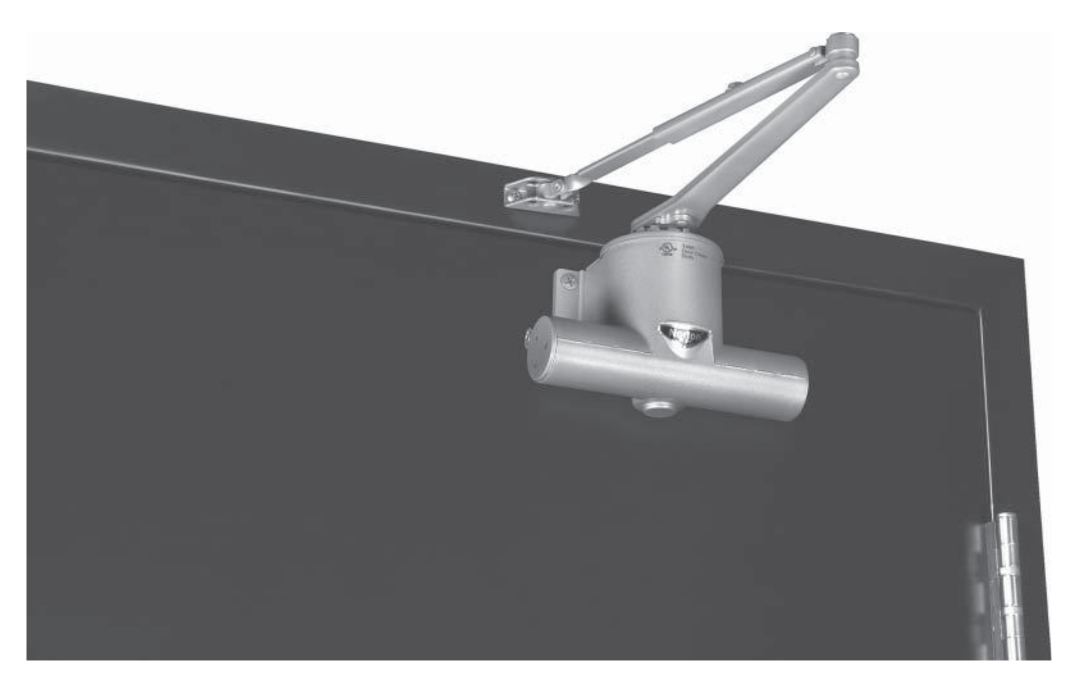


FIGURE 5.3 Pot Belly Surface-Mounted Door Closer
(Source: Courtesy of Norton® Door Controls)

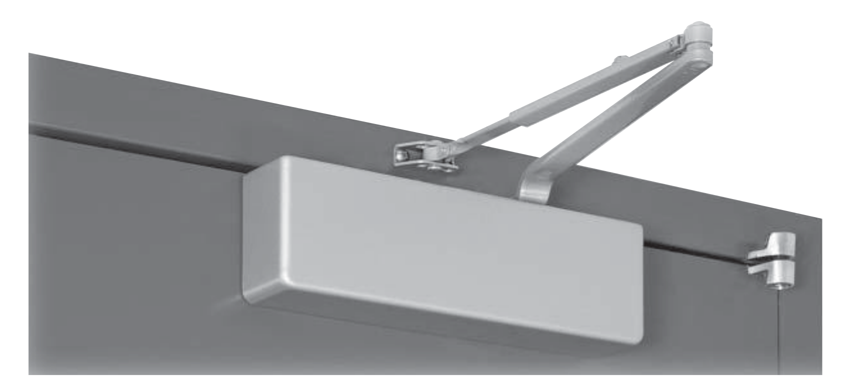


FIGURE 5.4 Regular Arm Door Closer
(Source: Courtesy of Norton® Door Controls)

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FIGURE 5.5 Top-Jamb-Mounted Door Closer
(Source: Courtesy of Norton® Door Controls)

door is set in a reveal, regular arm installation configuration will not allow the arm to extend enough to the frame face, whereas if the closer body is on the frame, the arm can extend into the reveal enough to reach the door face.

Overhead Concealed in the Frame

Overhead concealed in the frame door closers, along with concealed in the door ones, are the least efficient means of closing a door. This is typically due to the fact that the closer body is smaller than a surface-mounted closer and much smaller than a floor-mounted closer. The smaller body size means less room for the spring and valves, which assist in the optimum functionality of the closer.

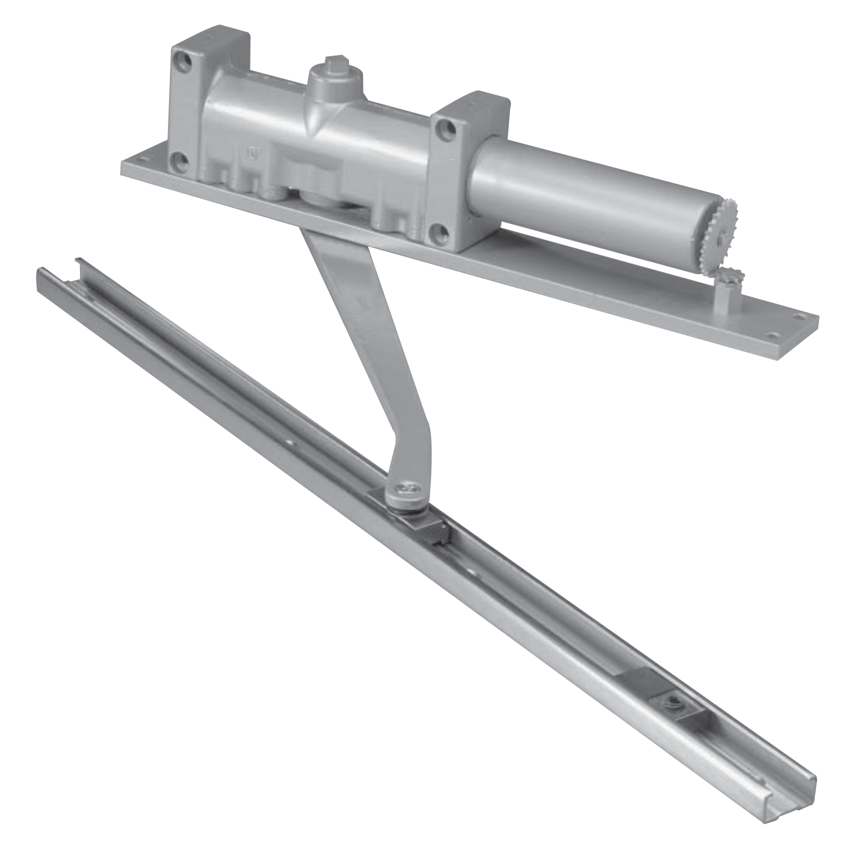


FIGURE 5.6 Concealed in the Frame Door Closer
(Source: Courtesy of Norton® Door Controls)

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Overhead Concealed in the Door

Similar to overhead concealed in the frame, overhead concealed in the door closers are the least efficient means of closing a door. This is typically due to the fact that the closer body is smaller than a surface-mounted closer and much smaller than a floor-mounted closer. The smaller body size means less room for the spring and valves, which assist in the optimum functionality of the closer.

Floor Mounted

Depending on the manufacturer, device, and applications, floor closers are typically the most efficient type of hanging device and should be your first choice for frequently used doors that need to self-close.

Please see Floor Closers in Chapter 1 for more information.

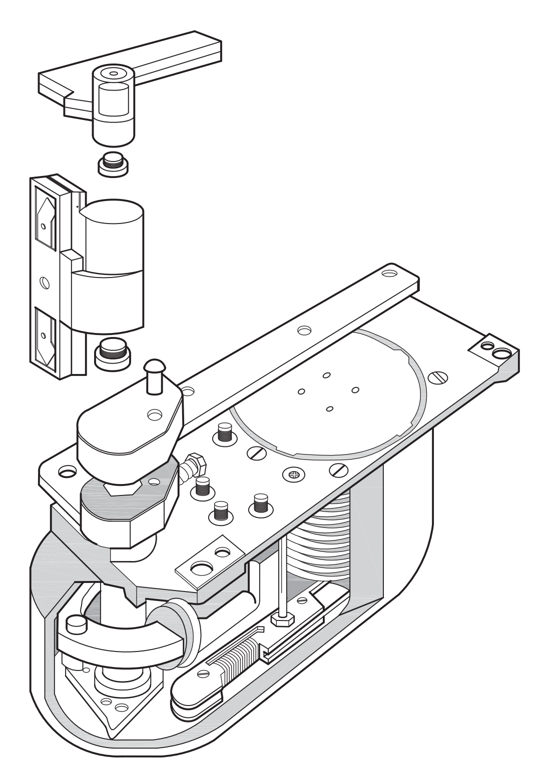


FIGURE 5.7 Floor-Mounted Door Closer
(Source: Courtesy of Rixson®)

OPTIONS

Cold Weather Fluid

Cold weather fluid is available in lieu of standard oil and fluids used to operate the floor closer. This fluid is specified and used in areas where extreme cold weather exists so that the fluid does not thicken or freeze, which affects the operation of the closer.

Cover

Door closers are available with a cover to hide the closer body and mounting hardware of the device such as the screws. Covers are available in both plastic and metal and come in various architectural finishes. Plastic closers have a painted finish to match the architectural finishes of other components

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installed on the door as closely as possible, such as a securing device. A metal cover has the architectural finishes available to match the other installed hardware more closely.

Delayed Action

A delayed action option delays, or slows down, the door and sometimes holds it for a short period of time at a certain degree. This option allows time for someone or something to pass through the doorway without rushing or getting hit by the door while moving through the opening, without the need for a hold open feature.

Fire Rated

Door closers are typically tested and manufactured as fire rated, but sometimes they might have to be specified and ordered as such. This means the material is steel or stainless steel and has been tested and passed by UL as fire rated.

Hold Open

Hold open option is available to hold the door closer and door in the open position, which is a fixed degree of opening. The hold open positions can vary depending on availability and cannot be used on fire rated doors, as it requires a mechanical hold open device.

Lead-Lined Cover

Surface-mounted closers have the option for a lead-lined cover. The cover typically covers the entire door closer including fasteners and body, so any holes made during installation would be covered by the lead-lined cover, protecting those outside of the room not intended to receive radiation.

Mounting Brackets

In addition to standard, parallel, and top-jamb-mounting brackets, other various mounting brackets are available to assist with special installations such as corner brackets, narrow rail brackets, and stop arm brackets.

Nonsized

Nonsized door closers are the easiest to work with as they are adjustable and can operate many different door sizes and weights. Be cautious, though, as some nonsized or adjustable closers might not have the power that is required to operate all door types, so be sure to check the manufacturer's recommendations to avoid returns, back charges, and doors that do not operate properly.

Physically Handicapped

This option indicates the opening force complies with ICC/ANSI A117.1 (International Code Council/American National Standards Institute) Accessible and Usable Buildings and Facilities, 2009, and the

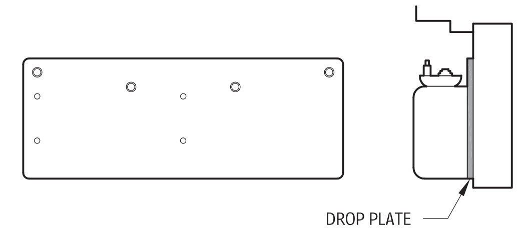


FIGURE 5.8 Narrow Top Rail Surface Door Closer Mounting Bracket

(Source: Courtesy of Norton® Door Controls)

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ADA Accessibility Guidelines for Buildings and Facilities (ADAAG). These standards require that any accessible opening have a 5-pound maximum opening force. This option cannot be used on fire rated or exterior door openings, which override accessible codes and standards. Be aware that this option reduces the opening force, which in turn reduces the closing force, and might prevent the door from closing and latching properly or at all.

Security Cover

Security covers are available for special applications requiring additional protection. These covers are manufactured of steel and have high-security fasteners, which are more difficult to tamper with and take more time to damage.

Sized

Door closers might be available with sizes, where the spring "size" provides the tension required for a particular door size or weight. Be cautious when using sized closers as they are not always easily adjustable and might not operate, that is, open or close a door properly.

Slide Track

Slide track installations are available for both the push and pull side of the door. This installation gives the door closer a more streamlined aesthetic but affects the performance of the device, making it less efficient than a standard installation. When installed on the pull side of the door, the closer is typically held open in a pocket and only closes when released during a fire alarm situation.

Special Layouts

Some installations require custom layouts, and some manufacturers are willing to work with you to see if they have the ability to customize their tooling to create special mounting configurations as required.

QUANTITIES

Door closers are typically installed as one per door leaf.

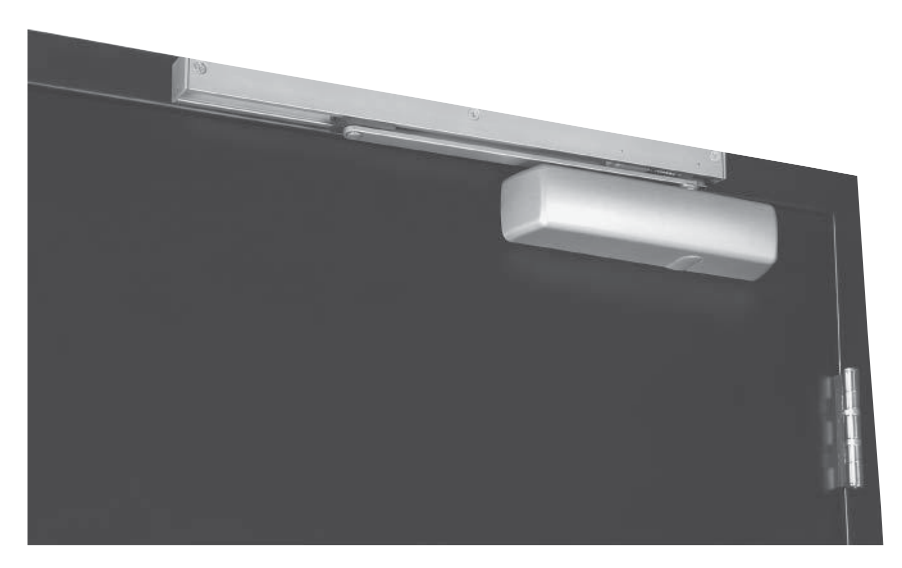


FIGURE 5.9 Surface-Mounted Slide Track Door Closer
(Source: Courtesy of Norton® Door Controls)

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APPLICATIONS

Concealed

Concealed closers can be concealed either in the head of the frame, the head of the door, or in the floor. The floor closer is typically the most efficient type of door-closing device due to its size and the fact that the floor creates the least tension for the door, allowing for a consistently efficient door operation.

Surface Mounted

The surface closer is the most used type, and can be mounted on the surface of the door and frame faces in various configurations. This is typically the second most efficient type of door closer behind the floor closer.

INSTALLATION

Surface-mounted door closers are typically installed on the face of the door and frame. Although this is the most common type of installation, it is not the most efficient. The floor closer is the ideal door-hanging and-controlling device due to its size and because it is on the floor, creating the least tension to the door opening and, if installed properly, a consistently effective operation.

One clue that a regular surface-mounted door closer is not installed properly is the regular arm position. The arm should typically be at 90 degrees, perfectly perpendicular to the door frame and door upon which it is installed. If the arm is at any other degree except for facing straight ahead, it is likely not installed properly.

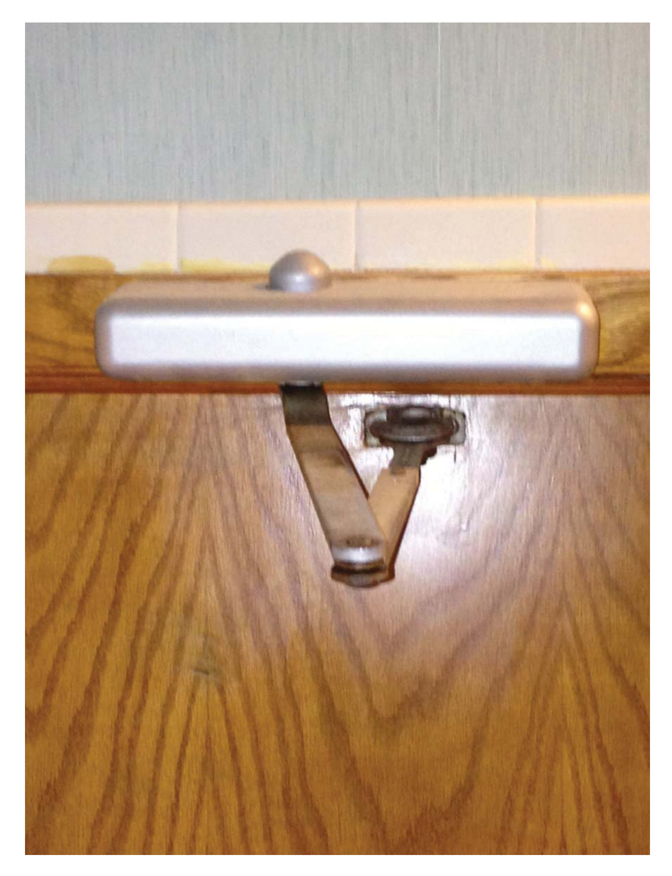


FIGURE 5.10 Regular Arm Door Closer Not Installed Properly
(Source: Scott J. Tobias)

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Be aware of door closer installations. A surface-mounted door closer that is mounted on the top rail of a door might require a certain dimension of the surface so that the closer is not visible through the glass. For example, if a door closer requires 5 inches of surface to be mounted and the top rail was not coordinated and is only 4 inches, there are typically brackets that can assist in mounting the closer, but 1 inch will be visible through the glass.

Concealed closers can be installed either with the closer body in the door and arm attached to the head of the frame or with the closer body in the head of the frame and the arm in the head of the door. Although the door closer disappears and this is aesthetically pleasing, both of these are the least effective means of closing a door because of the door closer body's size and lack of ability to efficiently close a door for long periods of time without requiring adjustments.

Floor closers are installed underneath the floor and are the most efficient type of door closer. They can also be used to hang the door in addition to closing it. This is also the most efficient means of hanging a door.

FASTENERS

Door closers are typically installed with screw fasteners, which are available for wood or metal door and frame material. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx. If installed on a wood door, proper closer "blocking" should be specified so that the reinforcements are there to support this very demanding piece of hardware, which puts a lot of stress on the door and frame upon which it is installed. If you are installing on a wood door, also consider through-bolt fasteners. Although

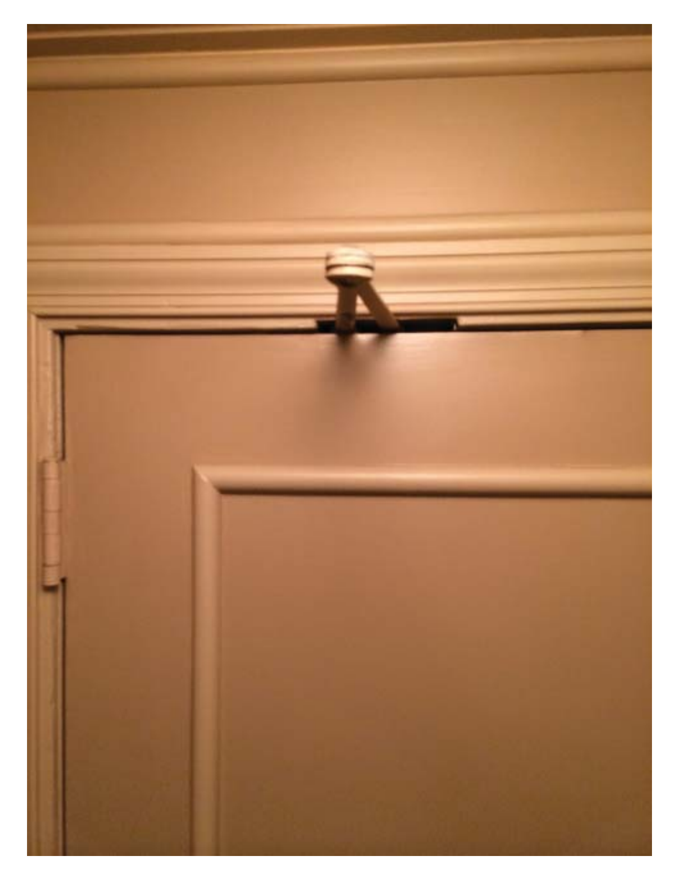


FIGURE 5.11 Door Closer and Door Molding Conflict
(Source: Scott J. Tobias, AHC/CDC, CFDI, CSI, LEED AP)

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not aesthetically pleasing, since they are visible from the opposite side of the door that the door closer is installed on, they will give the installation more stability and longevity.

Floor closer mounting screws are in shear, not tension. This means for the door to come off the frame, the heads of the screws would have to be sheared off horizontally and the door would have to be lifted off the floor portion of the floor closer arm. Floor closers are available offset or center hung.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

LOCATIONS

Door closers are installed on different points of the door, frame, and floor depending on the type and application and should be installed per the manufacturer's recommendations.

PREPARATIONS

Door closer preparations vary by type and application and are typically reinforced with additional materials inside the door to assist with the screw-holding force.

Screw holes are typically drilled and tapped at the factory for metal doors but not for wood doors unless specifically requested. Expect a costly up-charge when requesting factory drilling and tapping. Similar to a standard hinge, when using heavyweight floor closers, using thicker gauge metal for the pivot arms means that the door and frame preparations need to be coordinated with the thicker materials.

ELECTRONIC OR PNEUMATIC DOOR CLOSERS

Also Known As: Electric Door Closers

DESCRIPTION

Typically used to tie into fire alarm systems so that when the fire alarm is activated, the electronic closers shut off, and the door closer releases and closes to secure the opening as intended by code. There are also versions of electronic and pneumatic door closers that operate and swing the door and frame open automatically in addition to closed, without having to push or pull on the door. Pneumatics take it one step further and require air pressure to actually operate the device that opens and closes the door. A switch, very commonly an actuator device, which is a large pushbutton, activates the automatic operator or electronic system in general to begin the process.

Similar to door closers, electronic and pneumatic door closers are typically furnished with a closer body, which is installed at the head of a door and frame. There are other types of closing devices such as spring hinges and floor closers.

Finishes

Electronic and pneumatic door closer bodies do not have finishes as they are covered by a metal or plastic cover. Plastic covers are typically furnished with a painted or powder-coated architectural finish to match as close as possible the other hardware installed on the door, such as the locking device. Powder coating is a process of baking on the paint. While metal covers allow for the matching of most standard architectural finishes, but at an additional cost.

Grades

Electronic and pneumatic door closers are graded with grades 1, 2, or 3 depending on ANSI/BHMA test procedures. Such tests include cycle and various valve testing to meet minimum levels.

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Materials

The internal parts and covers of electronic and pneumatic door closers are manufactured from various metals and plastic, depending on the manufacturer. The arms are manufactured from brass, bronze, stainless steel, or steel, depending on their application and fire rated door opening requirements.

SPRING

A spring is typically found to be part of an electronic door closer, working together with hydraulic valves that require a lubricant to operate. The spring is wound and has tension in the same direction as the door swing, which helps with efficiency and operation of the door.

STOPS

Some electronic door closers have built-in stops, which hard-stop the door at a set degree of opening. The stop function is typically manufactured into the closer arm, and the opening degree is typically limited and depends on the application and manufacturer's offerings.

SWITCHES

Most devices have switches to operate timers and other operations of the device, depending on the functionality available and necessary for the proper operation of the opening.

VALVES

Electronic and pneumatic door closers might also have mechanical components or might only operate mechanically while opening or closing the door, depending on the device type, its options, and the application. Devices are manufactured with various valves to assist with optimizing the closing and latching speeds and forces. These valves act in cycles of the door opening and closing.

Backcheck

Backcheck valves allow for adjustment to the opening force past about 65 degrees of the door in the open position to give the door less resistance, making it easier to push open.

Delayed Action

Delayed action valves are available to delay the initial closing of the door. This will allow something that moves slower than average more time to move through the opening without the door pushing right up behind it.

Latch Speed

Latch speed valves allow for adjustment to the latching speed cycle. This is the speed once past the closing speed cycle and gives the door enough force and power to clear any of the locking device latches or any other surrounding conditions that might affect the closing, such as gaskets around the perimeter of the door.

Sweep Speed

Sweep speed valves allow for adjustment to the closing speed cycle. This is the speed once it is initially released, if the device has no delayed action option or once the delayed action has completed, and affects the closing up until about 15 degrees of the closed position.

TYPES

Floor Mounted

Depending on the manufacturer, device, and applications, floor-mounted electronic door closers are available to hang and close the door by activating a switch.

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Overhead Concealed in the Frame

Overhead concealed in the frame door closers have been known to be the least efficient means of closing a door. This is typically due to the fact that the closer body is smaller than that of a surface-mounted closer and much smaller than that of a floor-mounted closer. The smaller body size means less room for a spring and valves, which assist in the optimum functionality of the closer.

Surface Mounted

MOTION SENSOR HOLD OPEN

Some manufacturers offer an electronic motion sensor built into their door closer. This sensor detects movement in the doorway, which holds the door in the open position until there is no movement. Once there is no movement detected, the door closer releases, but if someone stands still in the opening, the door will not sense the presence and will release and close automatically. Of course, this could result in injury, so it is important to keep moving through the doorway.

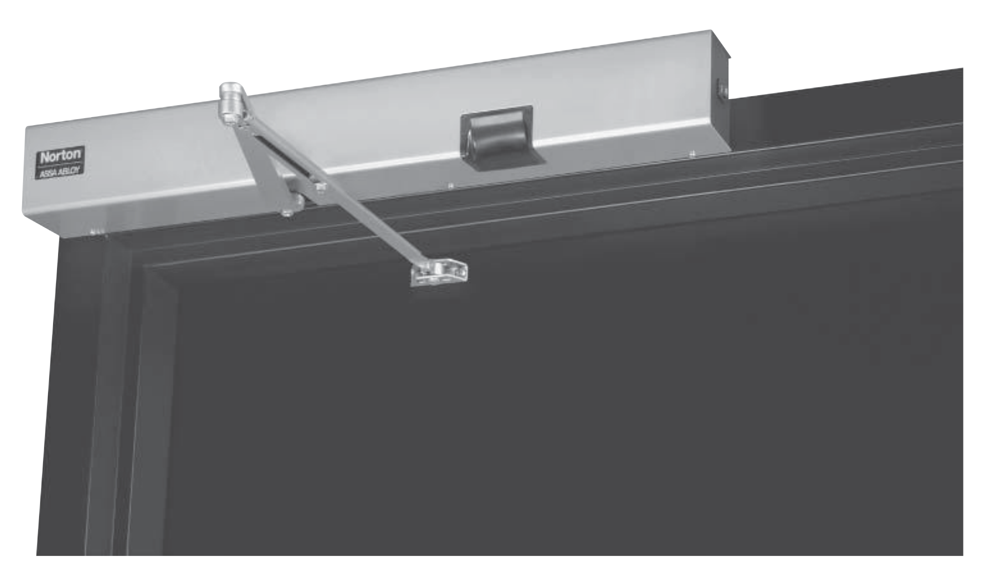


FIGURE 5.12 Electronic Motion Sensor Hold Open Door Closer
(Source: Courtesy of Norton® Door Controls)

PARALLEL ARM

The parallel arm surface-mounted electronic door closer mounts on the push side of the door and the arm is parallel with the door, making it less susceptible to vandalism or hanging off the arm. This type of installation is less efficient than the regular arm installation due to the configuration and requires more tension in the spring to close effectively.

REGULAR ARM

The regular arm surface-mounted electronic door closer is always mounted on the pull side of the door, with the arm protruding off the face of the door and frame. Regular arm installation is the most efficient of the surface-mounted installations due to the configuration and force of the arm.

SMOKE DETECTOR

Electronic closers can have a smoke detector feature that can be tied into a facility fire alarm system. Normally the door is held open, like a corridor door in a high-rise office building, but when the smoke is detected the alarm is set off, the closers release, and they close to secure the nonfire side of the door from the fire side.

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FIGURE 5.13 Door Closer with Built-In Smoke Detector
(Source: Courtesy of Norton® Door Controls)

TOP JAMB

A top-jamb-mounted surface-mounted electronic door closer body is mounted on the frame instead of the door, where the arm protrudes off the face of the frame door similar to regular arm installation. This application is typically used when the closer is mounted on the door's push side when there is a reveal. If the door is set in a reveal, regular arm installation configuration will not allow the arm to extend enough to the frame face, whereas if the closer body is on the frame, the arm can extend into the reveal enough to reach the door face.

OPTIONS

ACTUATOR

Actuators are nothing more than large heavy-duty pushbuttons that initiate a system or device in order to operate it. Basically it is a big switch that turns a device on and off. The actuator can be timed to open for a certain period, or it can be instantaneous, where it would only work while one is holding down the button.



FIGURE 5.14 Pushbutton Actuator
(Source: Courtesy of Scott J. Tobias)

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DEGREE OF OPENING

Most devices have the option to set the degree of opening. This allows for preferences to be set or accommodations to be made for any unexpected field or installation conditions.

ELECTRONIC SWITCH

In addition to the actuator, the electronic switch is the most common switch used to operate electronic and pneumatic door closers. Any other electronic switch also would operate the device if installed correctly and operated as intended. For example, a card reader system could be used to activate a closer or a motion sensor from the egress side of the door.

TIMER

Timers are typically built into electronic closing devices in order to set the preferred operation time for closing and holding open the door. The timers can be set to preference or to meet any required codes.

QUANTITIES

Electronic and pneumatic door closers are typically installed one per door leaf.

APPLICATIONS

Concealed

Concealed electronic and pneumatic door closers can be concealed either in the head of the frame, the head of the door, or in the floor. The floor closer is typically the most efficient type of door closing device due to its size and fact that the floor creates the least tension for the door, allowing for a consistently efficient door operation.

Surface Mounted

The surface-mounted electronic or pneumatic door closer is more efficient than any concealed device and can be mounted on the surface of the door and frame faces in various configurations.

INSTALLATION

Surface-mounted electronic and pneumatic door closers are typically installed on the face of the door and frame. Although this is the most common type of installation, it is not the most efficient.

Concealed electronic and pneumatic door closers can be installed either with the closer body in the door and arm attached to the head of the frame or with the closer body in the head of the frame and the arm in the head of the door. Although the door closer disappears and is aesthetically pleasing, these two types are the least effective means of closing a door due to the door closer body's size and lack of ability to efficiently close a door for long periods of time without requiring adjustments.

Electronic and pneumatic floor closers are installed underneath the floor. They can also be used to hang the door in addition to closing it. This is typically the most efficient means of hanging a door due to the weight being borne on the floor instead of in tension on the frame as is the case when they are hung by other means such as hinges.

Pneumatic devices require the installation of air-generating machines behind the wall that generate air pressure in order to operate the device installed on the door and frame. Pneumatic devices can be cost effective if you are installing many devices, although relying on air pressure and additional machines can be a challenge.

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Be aware of device installations. A surface-mounted device that is mounted on the top rail of a door might require a certain dimension of the surface so that the device is not visible through the glass. For example, if a device requires 5 inches of surface to be mounted on and the top rail is not coordinated and is only 4 inches, there are typically brackets that can assist in mounting the device, but 1 inch will be visible through the glass.

FASTENERS

Electronic door closers are typically installed with screw fasteners, which are available for wood or metal door and frame material. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx. If the door closer is installed on a wood door, proper closer "blocking" should be specified so that the reinforcements are there to support this very demanding piece of hardware, which puts a lot of stress on the door and frame upon which it is installed. If you are installing on a wood door, also consider through-bolt fasteners. Although not aesthetically pleasing, since they are visible from the opposite side of the door that the door closer is installed on, they will give the installation more stability and longevity.

Floor closer mounting screws are in shear, not tension. This means for the door to come off the frame, the heads of the screws would have to be sheared off horizontally and the door would have to be lifted off the floor portion of the floor closer arm. Floor closers are available as offset or center hung.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

LOCATIONS

Electronic door closers are installed on different points of the door, frame, and floor, depending on the type and application and should be installed per the manufacturer's recommendations.

PREPARATIONS

Electronic door closer preparations vary by type and application and are typically reinforced with additional materials inside the door to assist with the screw-holding force.

Screw holes are typically drilled and tapped at the factory for metal doors but not for wood doors, unless specifically requested. Expect a costly up-charge when requesting factory drilling and tapping. Similar to a standard hinge, when using heavyweight floor closers, using thicker-gauge metal for the pivot arms means that the materials will be thicker and the door and frame preparations need to be coordinated.

POWER-OPERATED DOOR CLOSERS

Also Known As: Automatic Operators, Auto Operators, Automatic Door Openers, Auto Door Openers, Electric Door Closers

DESCRIPTION

Typically used to assist with the operation of a doorway, such as an accessible opening for the elderly or disabled, a switch, very commonly an actuator device, which is a large pushbutton, activates the automatic operator or electronic system in general to begin the process.

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Similar to standard door closers, power-operated door closers are typically furnished with a closer body, which is installed at the head of a door and frame.

Finishes

Power-operated door closer bodies do not have finishes as they are covered by a metal or plastic cover. Plastic covers are typically furnished with a painted or powder-coated architectural finish to match as closely as possible the other hardware installed on the door such as the locking device. Powder coating is a process of baking on the paint. Metal covers allow for the matching of most standard architectural finishes, but for an additional cost.

Grades

Power-operated door closers are graded with grades 1, 2, or 3 depending on ANSI/BHMA test procedures. Such tests include cycle- and various valve- testing to meet minimum levels.

Materials

The internal parts and covers of power-operated door closers are manufactured from various metals and plastic, depending on the manufacturer. The arms are manufactured from brass, bronze, stainless steel, or steel, depending on their application and fire rated door opening requirements.

SPRING

A spring is typically found to be part of a power-operated door closer, working together with hydraulic valves that require a lubricant to operate. The spring is wound and has tension in the same direction as the door swing, which helps with efficiency and operation of the door.

STOPS

Some power-operated door closers have built-in stops, which hard-stop the door at a set degree of opening. The stop function is typically manufactured into the closer arm and the opening degree is typically limited and depends on the application and manufacturer's available choices.

SWITCHES

Most devices have switches to operate timers and other operations of the device, depending on the functionality available and necessary for the proper operation of the opening.

VALVES

Power-operated door closers might also have mechanical components or might only operate mechanically while opening or closing the door, depending on the device type, its options, and its application. Devices are manufactured with various valves to assist with optimizing the closing and latching speeds and forces. These valves act in cycles of the door opening and closing.

Backcheck

Backcheck valves allow for adjustment to the opening force past about 65 degrees of the door in the open position to give the door less resistance and to make it easier to push open.

Delayed Action

Delayed action valves are available to delay the initial closing of the door. This will allow something that moves slower than average more time to move through the opening without the door pushing right up behind it.

Latch Speed

Latch speed valves allow for adjustment to the latching speed cycle. This is the speed once past the closing speed cycle that gives the door enough force and power to clear any of the locking device

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latches or any other surrounding conditions that might affect the closing, such as gaskets around the perimeter of the door.

Sweep Speed

Sweep speed valves allow for adjustment to the closing speed cycle. This would be the speed once the door is initially released, if the device has no delayed action option or once the delayed action has completed, and affects the closing up until about 15 degrees of the closed position.

TYPES

Floor Mounted

Depending on the manufacturer, device, and applications, floor-mounted power-operated door closers are available to hang and close the door by activating a switch. Most of these devices allow the door to be operated manually, similar to a mechanical door closer in case of an electrical power failure.

Overhead Concealed in the Frame

Overhead concealed in the frame power-operated door closers have been found to be the least efficient means of closing a door. This is typically due to the fact that the closer body is smaller than a surface-mounted closer body and much smaller than a floor-mounted closer body. The smaller body size means less room for spring and valves, which assist in the optimum functionality of the closer. With that said, they have improved throughout the years and are a good means to conceal the automated device, while maintaining the opening's aesthetics and operation.

Surface Mounted

PARALLEL ARM

The parallel-arm surface-mounted power-operated door closer mounts on the push side of the door and the arm is parallel with the door, making it less susceptible to vandalism or hanging off the arm. This type of installation is less efficient than the regular arm installation due to the configuration and requires more tension in the spring to close effectively.



FIGURE 5.15 Surface-Mounted Low-Energy Operator
(Source: Courtesy of Norton® Door Controls)

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REGULAR ARM

The regular arm surface-mounted power-operated door closer is always mounted on the pull side of the door, with the arm protruding off the face of the door and frame. Regular arm installation is the most efficient of the surface-mounted installations due to the configuration and force of the arm.

TOP JAMB

A top-jamb-mounted surface-mounted electronic door closer body is mounted on the frame instead of the door, where the arm protrudes off the face of the frame door similar to regular arm installation. This application is typically used when the closer is mounted on the door's push side when there is a reveal. If the door is set in a reveal, regular arm installation configuration will not allow the arm to extend enough to the frame face, whereas if the closer body is on the frame, the arm can extend into the reveal enough to reach the door face.

OPTIONS

ACTUATOR

Actuators are nothing more than large, heavy-duty pushbuttons that initiate a system or device in order to operate it. Basically, an actuator is a big switch that turns a device on and off. The actuator can be timed to open for a certain period of time, or it can be instantaneous, where it only works while one is holding down the button.

DEGREE OF OPENING

Most devices have an option to set the degree of opening. This allows for preferences to be set or accommodations to be made for any field or installation conditions that were unexpected.

ELECTRONIC SWITCH

In addition to the actuator, the electronic switch is the most common switch used to operate electronic and pneumatic door closers. Any other electronic switch would also operate the device if installed correctly and operated as intended. For example, a card reader system can be used to activate a closer or a motion sensor from the egress side of the door.

FLOOR MATS

Floor mats are available to act as a switch, similar to those you might be familiar with at a grocery store. When you step on the mat a switch is activated, which starts the operation of automatically operating and swinging open the door.

HIGH ENERGY

Some devices are available in high energy versions. They operate at faster speeds and might require a higher voltage or more amps for operation. These devices are typically used on exterior openings and any door that might need to open and close quickly, like an operating room door in a hospital.

LOW ENERGY

Most common devices are low or standard energy. They operate at standard speeds and likely require standard voltage and amps for operation. These devices are typically used on interior openings such as corridors, restrooms, or any door that might need assistance automatically.

MOTION SENSORS

Motion sensors are available as a switch, typically on the egress side of a power-operated door. When one moves toward the opening in order to egress, the sensor senses the movement, which starts the operation of automatically operating and swinging open the door.

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SAFETY RAILS

When high-energy devices are installed, some codes and standards require the use of safety rails on either side leading up to the opening. These rails act as a guide into the opening and assist with minimizing any injuries from the high-powered operation of the door.

SENSORS

When high-energy devices are installed, some codes and standards require the use of sensors on either side of the opening to sense any presence that might interfere or injure a person in the path of operation. These sensors assist with minimizing any injuries from the high-powered operation of the door.

SERVICE CONTRACTS

High-energy power-operated door operators are installed by the provider or certified manufacturer installer in order to ensure optimum installation and maintenance. These installations typically offer service contracts, which require a monthly fee and long-term commitment. This gives the owner security knowing that someone is always on call if something is not operating properly on a highly sensitive and active door opening.

TIMER

Timers are typically built into power-operated door closing devices in order to set the preferred operation time for closing and holding open the door. The timers can be set to preference or to meet any required codes.

QUANTITIES

Powered door closers are typically installed one per door leaf, although there are devices built for a pair of doors.

APPLICATIONS

Concealed

Concealed power-operated door closers can be concealed either in the head of the frame, the head of the door, or in the floor. The floor closer is typically the most efficient type of door closing device due to its size and fact that the floor creates the least tension for the door, allowing for a consistently efficient door operation.

Surface Mounted

The surface-mounted power-operated door closer is more efficient than any concealed device and can be mounted on the surface of the door and frame faces in various configurations.

INSTALLATION

Surface-mounted power-operated door closers are typically installed on the face of the door and frame. Although this is the most common type of installation, it is not the most efficient. The floor closer is the ideal door hanging and controlling device.

Concealed power-operated door closers can either be installed with the closer body in the door and arm attached to the head of the frame, or the closer body in the head of the frame and the arm in the head of the door. Although the door closer disappears, and this is aesthetically pleasing, these two types are the least effective means of closing a door due to the door closer body's size and lack of ability to efficiently close a door for long periods of time without requiring adjustments.

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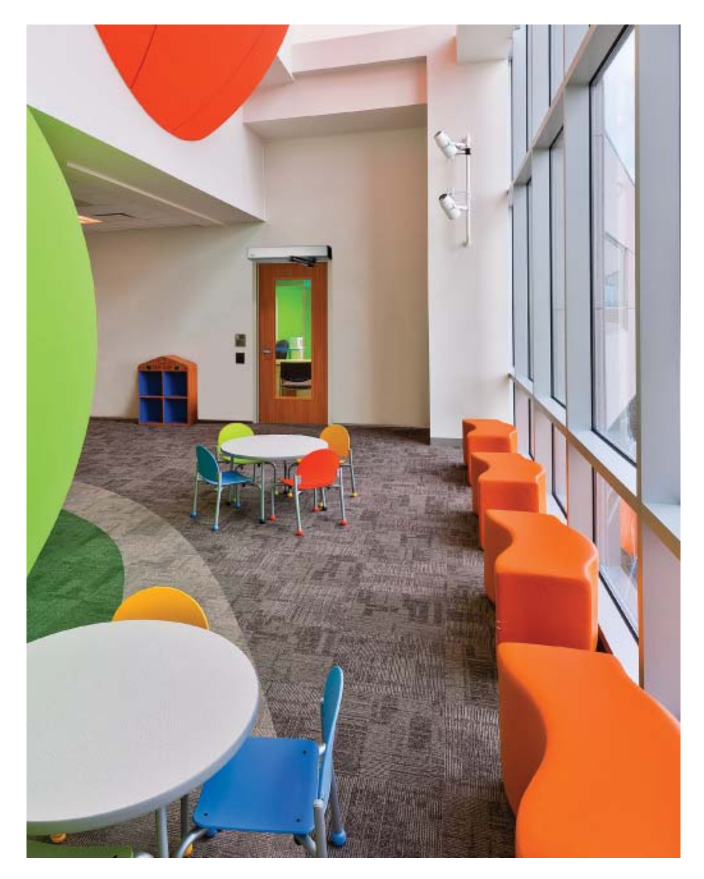


FIGURE 5.16 Single Door with Power Door Operator
(Source: ASSA ABLOY Entrance Systems)



FIGURE 5.17 Surface-Mounted Powered Door Operator
(Source: ASSA ABLOY Entrance Systems)

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Power-operated floor closers are installed underneath the floor. They can also be used to hang the door in addition to closing the door and are typically the most efficient means of hanging a door due to the weight being borne on the floor instead of in tension on the frame when hung by other means such as hinges.

FASTENERS

Power-operated door closers are typically installed with screw fasteners, which are available for wood or metal door and frame material. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx. If this type of closer is installed on a wood door, proper closer "blocking" should be specified so that the reinforcements are there to support this very demanding piece of hardware, which puts a lot of stress on the door and frame on which it is installed. If you are installing on a wood door, also consider through-bolt fasteners. Although not aesthetically pleasing, since they are visible from the opposite side of the door that the door closer is installed on, they will give the installation more stability and longevity.

Floor closer mounting screws are in shear, not tension. This means for the door to come off the frame, the heads of the screws would have to be sheared off horizontally and the door would have to be lifted off the floor portion of the floor closer arm. Floor closers are available offset or center hung.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Be aware of device installations. A surface-mounted device that is mounted on the top rail of a door might require a certain dimension of the surface so that the device is not visible through the glass. For example, if a device requires 5 inches of surface to be mounted and the top rail was not coordinated and is only 4 inches, there are typically brackets that can assist in the mounting of the device, but 1 inch will visible through the glass.

LOCATIONS

Power-operated door closers are installed on different points of the door, frame, and floor, depending on the type and application and should be installed per the manufacturer's recommendations.

PREPARATIONS

Power-operated door closer preparations vary by type and application and are typically reinforced with additional materials inside the door to assist with the screw-holding force.

Screw holes are typically drilled and tapped at the factory for metal doors but not for wood doors, unless specifically requested. Expect a costly up-charge when requesting factory drilling and tapping. Similar to a standard hinge, when using heavyweight floor closers, using thicker gauge metal for the pivot arms means that the materials will be thicker and the door and frame preparations need to be coordinated.

OVERHEAD DOOR STOPS AND OR HOLDERS

Also Known As: Door Checks

DESCRIPTION

An overhead stop is used when a wall or floor stop installation is not feasible. If the door swings into a corridor with no wall around, or nowhere to put one on the floor out of the walking path, an overhead

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stop can be installed. Either surface-mounted on the push side face of a door or concealed in the door and connected to the frame, these devices provide protection to the door and surrounding elements.

The devices typically look the same but can have either a stop-only function, where the door stops at a set degree, or a holder function, where the door is held open at a certain degree. Some devices allow the switching of functionality, but more often they are dedicated to either stopping or holding a door.

Door holders cannot be used on fire rated doors as fire rated doors must close automatically at the time of a fire, and a mechanical holder would not allow that. There are certain electronic devices available to hold open a door while being tied into a fire alarm system, which releases the device and door at the time of a fire, protecting either side of the opening as required by code.



FIGURE 5.18 Various Overhead Stops and Holders
(Source: Courtesy of Rixson®)

PROPERTIES

Overhead stops and holders are typically track-and-arm configurations that have various components such as an arm bracket, springs for stopping and protecting the device, and slider devices to move along the channel track.

Finishes

Depending on the material, overhead stops and holders are available in most architectural finishes to match the balance of the hardware installed on the opening such as the lockset and hinges. Metal

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devices have matching metal finishes, while plastic housings might have powder-coated or painted finishes. Powder coating is a process of baking on the paint.

Grades

ANSI/BHMA American National Standard for Door Controls—Overhead Stops and Holders, 2010, compares testing for various grades for overhead stops and holders. Those that have passed cycle tests of 250,000 comply for grade 1, while 100,000 cycles will get them a grade 2, and 50,000 grade 3. There are other tests for grades, such as force tests and finish tests.

Materials

An overhead door stop and holder can be manufactured from many types of materials but is typically manufactured from metal, including its components such as springs. A channel is typically manufactured from metal but could be manufactured from plastic or another accepted material as long as it passes the testing requirements.

TYPES

There are various types or configurations for overhead stops and holders, but they are all a basic design that attach to both the door and frame, limiting the extent of swing or holding open of the door.

Jointed Arm

A jointed arm overhead stop or holder has an additional arm and attachment that the standard overhead stop configuration doesn't have. This allows for additional shock absorbing by adding a spring component at the additional joint.



FIGURE 5.19 Jointed Arm Surface-Mounted Overhead Stop
(Source: Courtesy of Rixson®)

Rod

A rod overhead stop or holder is a single rod that slides in and out of a guide. This does not allow for as much flexibility or added functionality in the device, such as additional springs or friction hold-open options that a channel device might have.

Slide

Typically in a channel form, the slide overhead stop or holder are the most frequently used type of overhead device. The slide arm and channel allow for the addition of some functionality such as springs to help absorb the pressure of the door opening and stopping at a certain degree.

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FIGURE 5.20 Slide Overhead Stop
(Source: Courtesy of Rixson®)

OPTIONS

Cantilever

Also a jointed arm type of overhead stop and holder, the cantilever arm is shaped in an angled or bowed configuration as compared to the conventional straight-arm configuration. This might allow the device to extend a few extra degrees when swinging open due to the curve of the arm.

Double Acting

Concealed devices might have the ability to work with double acting doors. This door type is typically hung with a center-hung pivot or floor closer and can swing in either direction through the door opening. Surface-mounted devices do not have this ability as they are installed on the push side face of the door and the configuration will not allow for double acting functionality.

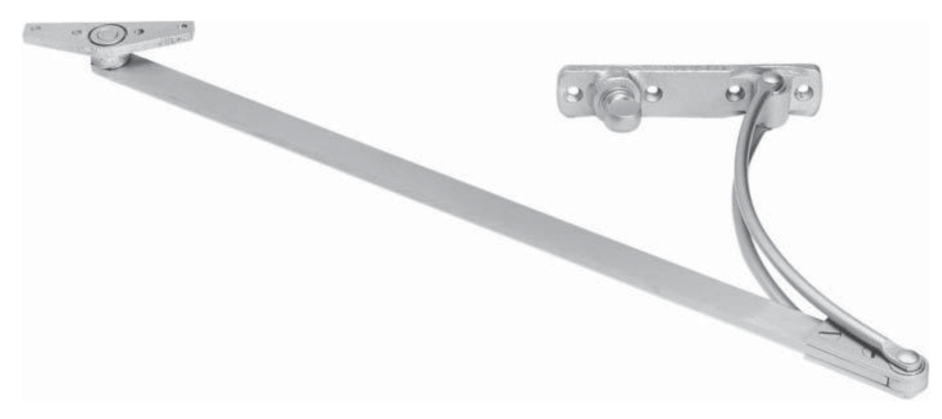


FIGURE 5.21 Cantilever Arm Overhead Stop
(Source: Courtesy of Rixson®)

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Friction

A friction device allows the door to "stick" at the position in which it is left. This is not to say it is "holding the door open" or even that it offers a hold-open option, because it will move with the touch of a hand, but does have a bit of resistance or friction to keep the door steady.

Hold Open

Hold-open overhead stops and holders have the functionality to actually hold open a door in a certain position, typically predetermined by the user. This might be helpful when the door is very active but does not have the need to close automatically such as a fire rated door does.

Selective Hold Open

Selective hold-open overhead stops and holders have the functionality to actually hold open a door in a certain position, but rather than doing so at a fixed degree predetermined by the user, the degree can be selected as the user needs. In other words, the hold-open can be 85 degrees one time, and 110 another, depending on the users' needs. This might be helpful when the door is very active but does not have the need to close automatically such as a fire rated door does.

Single Acting

Surface-mounted or concealed devices have the ability to work with single acting doors. This type of door is typically hung with hinges, continuous hinges, or offset pivots or floor closers, but it can be hung on center-hung pivots or floor closers. This door type can only swing in one direction in the door opening. Surface-mounted devices do not have this ability, as they are installed on the push-side face of the door and the configuration will not allow for double acting functionality.

Stop

An overhead stop function stops the door without having the ability to hold it open. The degree of opening is typically predetermined and set upon installation, and protects the door and surrounding elements from damage.

QUANTITIES

Overhead stops and holders are typically installed one per door leaf.

APPLICATIONS

Concealed

Concealed overhead stops and holders are available to minimize the visibility of the hardware itself. The device is typically installed inside of the door with the arm attached to the head of the door frame.

Surface

Due to the device configuration, surface-mounted overhead stops and holders are typically installed on the push side face of the door with the arm attached to the head of the door frame.

INSTALLATION

Overhead door stops and holders can be installed on the face of a door and frame or concealed in the head of a frame and attached to a door. Some surface- and floor-mounted door closers have the option to have a stop built into their functionality, but they might not be as reliable as a dedicated stop. Depending on the frequency of door swing use, various installation types are available.

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Fasteners

Overhead door stops and holders are typically installed with screw fasteners, which are available for wood or metal door and frame material. Phillips and flat-head screws are available, depending on the manufacturer's standard, and special screw heads are available as an option, including security, security stud, and torx. If the device is installed on a wood door, proper closer "blocking" should be specified so that the reinforcements are there to support this very demanding piece of hardware, which puts a lot of stress on the door and frame upon which it is installed. If you are installing on a wood door, also consider through-bolt fasteners. Although not aesthetically pleasing, since they are visible from the opposite side of the door that the door closer is installed on, they will give the installation more stability and longevity.

It is recommended that the proper fasteners be specified for efficient installation rather than relying on a box of self-tapping screws, which might be more convenient for the installer.

Locations

Overhead door stops and holders should be installed at locations as recommended by industry standards and codes, which are typically measured from the finished floor. Regardless of the door and frame type, whether considered they are standard or custom metal, wood, or aluminum, standards recommend starting the first hinge from the finished floor.

Preparations

Overhead door stops and holder preparations vary, depending on the type. Surface-mounted devices are typically face-applied in the field while concealed overhead stops are typically machined at the factory, including the drilling and tapping of screw holes. Surface-mounted overhead devices vary by manufacturer, with some requiring frame preparation.

REFERENCES

Codes and standards are available to set the minimum requirements of door openings (see the Introduction of this book for more information). Some jurisdictions have specific codes and standards, which were either modified from another existing code or created for their own use.

Language and section numbers can change slightly or drastically when the codes are updated. Look for an outline, if available, of the changes that took place in the respective update.

CODES

International Building Code (IBC)

The following are sections of a modified or fully adopted version of the International Building Code, which refer to closing and controlling devices or door hardware in general.

- Chapter 7: Fire and Smoke Protection Features
- Chapter 10: Means of Egress
- Chapter 17: Special Inspections and Tests

National Fire Protection Association (NFPA) 101: Life Safety Code

The following is a chapter of a modified or fully adopted version of the NFPA 101: Life Safety Code, which refers to closing and controlling devices or door hardware in general:

- Chapter 7: Means of Egress

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STANDARDS

ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)

The following is a chapter of a modified or fully adopted version of the ADA Accessibility Guidelines for Buildings and Facilities, which refers to closing and controlling devices or door hardware in general:

- Chapter 4: Accessible Routes

ASTM International (ASTM)

There are hundreds of ASTM International testing standards that are related to doors and door hardware, from material and assembly testing to installation and application testing.

Door and Hardware Institute (DHI)

Following are technical documents available for reference that refer to closing and controlling devices or door hardware in general:

- Abbreviations and Symbols
- Basic Architectural Hardware
- Hardware for Healthcare Facilities
- Installation Guide for Doors and Hardware
- Processing Hardware for Custom Aluminum Entrances
- Recommended Locations for Builders Hardware Custom Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Flush Wood Doors
- Recommended Procedures for Processing Hardware Schedules and Templates
- Sequence and Format for the Hardware Schedule
- Tech-Talk ASD-1 Aluminum Storefront Doors
- Tech-Talk EAH-91 Electrified Architectural Hardware
- Tech-Talk FC-1 Concealed Floor Closers
- Tech-Talk SDC-92 Surface Door Closers
- Tech-Talk SP-1 Hardware Specification Writing

International Code Council A117.1 Accessible and Usable Buildings and Facilities, (ICC)

The following is a chapter of a modified or fully adopted version of the ICC A117.1 Accessible and Usable Buildings and Facilities, which refers to closing and controlling devices or door hardware in general:

- Chapter 4: Accessible Routes

National Fire Protection Association (NFPA)

The following are chapters of a modified or fully adopted version of NFPA 80: Standard for Fire Doors and Other Opening Protectives, which refer to closing and controlling devices or door hardware in general:

- Chapter 5: Care and Maintenance
- Chapter 6: Swinging Doors with Builders Hardware
- Chapter 7: Swinging Doors with Fire Door Hardware
- Chapter 8: Horizontally Sliding Doors
- Chapter 9: Special-Purpose Horizontally Sliding Accordion or Folding Doors
- Chapter 16: Access Doors

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- Chapter 19: Installation, Testing, and Maintenance of Fire Dampers
- Annex A: Explanatory Material

The following is a chapter of a modified or fully adopted version of NFPA 105: Standard for Smoke Door Assemblies and Other Opening Protectives, which refers to closing and controlling devices or door hardware in general:

- Chapter 6: Installation, Testing, and Maintenance of Smoke Dampers

The following is a chapter of a modified or fully adopted version of NFPA 252: Standard Method of Fire Tests of Door Assemblies, which refers to closing and controlling devices or door hardware in general:

- Chapter 5: Fire Door Assembly
- Annex B: Commentary

American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA)

The following are ANSI/BHMA Standards that refer to closing and controlling devices or door hardware in general:

- ANSI/BHMA A156.4 American National Standard for Door Controls—Closers
- ANSI/BHMA A156.8 American National Standard for Door Controls—Overhead Stops and Holders
- ANSI/BHMA A156.10 American National Standard for Power Operated Pedestrian Doors
- ANSI/BHMA A156.15 American National Standard for Release Devices—Closer Holder, Electromagnetic and Electromechanical
- ANSI/BHMA A156.18 American National Standard for Materials and Finishes
- ANSI/BHMA A156.19 American National Standard for Power Assist and Low Energy Power Operated Doors
- ANSI/BHMA A156.27 American National Standard for Power and Manual Operated Revolving Pedestrian Doors
- ANSI/BHMA A156.32 American National Standard for Integrated Door Opening Assemblies
- ANSI/BHMA A156.115 American National Standard for Hardware Preparation in Steel Doors and Steel Frames
- ANSI/BHMA A156.115W American National Standard for Hardware Preparation in Wood Doors with Wood or Steel Frames

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Protective Plates and Trim

Next in the sequence are protective plates. Protective plates do just what they say, protect the door as a layer installed on the surface of the door. Some doors can be very expensive to replace, so rather than damaging, dinging, denting, scratching, or ruining the surface of a door itself, the protection plate can take the abuse. A protection plate is also typically less expensive to replace than an entire door, so if the surface of the plate gets very damaged, it can be replaced at less cost.

ARMOR PLATES

Also Known As: Armor Protective Plate, Armor Protection Plate, Protection Plate, Protective Plate

DESCRIPTION

Armor plates are typically installed on the bottom half of doors that require protection from an object moving through the door opening that might cause damage to the door's surface. Protection plates have different names depending on their sizes, and armor plates are typically any size above 12 inches and up to 48 inches in height.

PROPERTIES

Finishes

Armor plates are typically available in a limited number of architectural finishes and should comply with the current version of ANSI/BHMA A156.18 American National Standard for Materials and Finishes.

Grades

Armor plates are not categorized in grades but should comply with standards in Workmanship as described for Product Category J100 in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

Armor plates are available in different duties, which depend on the thickness and type of material used.

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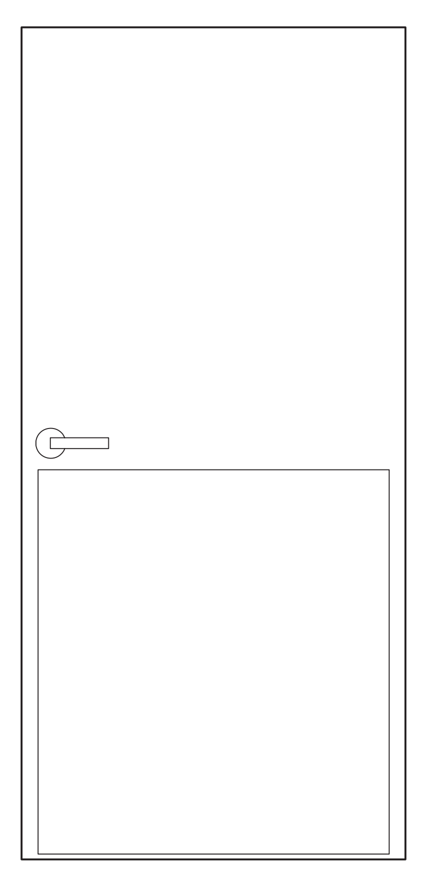


FIGURE 6.1 Armor Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

METAL

Standard Duty

Standard duty metal armor plates are manufactured from a minimum .050-inch-thick material according to ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Heavy Duty

Heavy-duty metal armor plates are manufactured from a minimum .062-inch-thick material.

Extra Heavy Duty

DIAMOND PLATE

A diamond plate extra heavy–duty armor plate, which is a smooth surface similar to standard metal armor plates, is manufactured from a .125-inch-thick material with a raised diamond plate surface.

FLAT SURFACE PLATE

A flat surface plate extra heavy–duty armor plate, which is a smooth surface similar to standard metal armor plates, is manufactured from a .125-inch-thick material.

PLASTIC

Flexible PVC or Acrylic Alloy

Flexible PVC or acrylic alloy plastic armor plates are manufactured from a minimum .060-inch-thick material according to ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

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FIGURE 6.2 Diamond Plate Surface
(Source: Courtesy of Rockwood® Manufacturing Company)

Laminate

Standard-duty plastic armor plates are manufactured from a minimum 1/8-inch-thick material according to ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Materials

Armor plates can be manufactured from aluminum, brass, plastic, or stainless steel. Armor plates should comply with Materials for Product Category J100 as described in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

TYPES

Armor plates come in one type, which can be manufactured from different materials, in various sizes, using different mounting methods. The current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim describes armor plates as Product Category J100.

Metal

A metal armor plate is categorized as J101 in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

A plastic armor plate is categorized as J105 in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

SIZES

Height and Width

Although the sizes may vary depending on interpretation, armor plates are typically specified by height and width and are installed 1 1/2 inches less than the door width on the pull side of the door and 2 inches less than the door width on the push side of the door. These dimensions are for doors installed in standard door frames that have standard 5/8-inch stops projecting into the door opening clear width. The deduction of 2 inches on the push side is so the plate does not bind with the frame stops and the deduction of 1 1/2 inches on the pull side is so the fasteners have sufficient space to secure to.

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Armor plates are typically any height over 12 inches, which is the typical maximum height of a kickplate, and 48 inches, which is above any standard-height cart or object that might move through the door opening.

Thickness

Standard armor plates are available in various thicknesses depending on the intended use and frequency.

OPTIONS

Anti-Microbial Coating

Armor plates are available with an optional anti-microbial coating. The coating is a silver ion–based clear coating that helps stop the spread of bacteria. Although there are silver ions, they are not visible to the eye and a brass or bronze finish shows its true color through the coating. Silver has been used throughout history to help reduce the spread of bacteria and infection: Why not put it on doors and hardware that is touched over and over again by numerous people in a day?

Countersunk Holes

Armor plates might not be manufactured standard with countersunk holes, and this should be specified if desired. If the holes are not countersunk, the head of the screws will protrude off the face of the door, whereas countersunk holes will allow the head of the screws to install flush with the face of the armor plate.

Cutouts

Some doors might have louvers, a lockset, or other conflicting hardware where an armor plate might be installed. Therefore, manufacturers will provide special cutouts, if ordered properly. Otherwise, field cutting might not give the accuracy required for the conflicting hardware devices to operate properly or at all.

Edges

BEVELED

Armor plates have the option for beveled edges. In addition to being an aesthetic preference, beveled edges are softened at the end to a 45-degree angle back to the door instead of having a 90-degree square edge. Although four beveled edges are available as an option, three beveled edges are also available for those who are not particular about the bottom edge. The bottom edge of an armor plate is typically flush with the bottom of the door and is beveled, leaving it at a square edged, 90-degree angle.

SQUARE

Armor plates might have the option for all four square edges. As described above, three beveled edges are an option, leaving at least one, the bottom edge of the armor plate, a square edged. In addition to being an aesthetic preference, square edges are a 90-degree cut back to the door. Caution should be used, however, as the edges can be sharp.

Engraving

Manufacturers have the ability to engrave armor plates. Engraving requests might include a room number in an office, educational, or healthcare facility, or possibly an exit sign with photoluminescent properties.

Labeling

Until a change in codes occurred, which forced a change in manufacturing and testing requirements, protection plates higher than 16 inches from the bottom edge of the door could not be installed on

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fire rated doors. Now, some manufacturers have tested their plates for installation on fire-rated doors no matter what the height of the plate or fire label of the door.

Shapes

A typical armor plate is square with squared corners, but some manufacturers offer shaped protection plates, which allow for curves and designs to be incorporated into the shape.

QUANTITIES

Armor plates are furnished in single quantities and should be specified one for each door surface required.

APPLICATIONS

Surface Mounted

Armor plates are surface-mounted, typically on the push side face of a door.

Angle Plate

BOTTOM

An angle plate also covers one or two sides of the door in addition to the face of the door.

ONE SIDED

A one-sided angle plate wraps around one side edge of the door in addition to the face of the door.

TWO SIDED

A two-sided angle plate wraps around both side edges of the door in addition to the face of the door.

INSTALLATION

Armor plates are typically installed on the push side face of a door.

Fasteners

Armor plates are typically installed with screw fasteners, which are available for installation on wood or metal door materials. An armor plate typically has countersunk screw holes around the perimeter, which should comply with ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

COUNTERSUNK

Armor plates might not be manufactured standard with countersunk holes and this should be specified if desired. If the holes are not countersunk, the head of the screws will protrude off the face of the door, whereas countersunk holes will allow the head of the screws to install flush with the face of the armor plate.

SELF-ADHESIVE

Armor plates are available with a self-adhesive double-faced tape option in lieu of screw fasteners. If self-adhesive tape is used, the armor plate typically will not have any screw holes as with a typical installation.

SURFACE MOUNTED

Armor plates might not be manufactured standard with countersunk holes. The screws would be installed surface-mounted on the plate with the head of the screws protruding off the face of the armor plate.

Locations

Armor plates should be installed on the bottom half of the push side of a door surface to protect the door from objects moving through the door opening that might cause damage to the door surface.

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Preparations

Armor plate preparations are not required if self-tapping screws are not being used, and the screw holes are drilled and tapped in the field by the installer.

DOOR EDGE GUARDS

Also Known As: Door Edge Plates, Edge Guards, Edge Plates

DESCRIPTION

Door edge guards are typically installed at the edges of a door that require protection from an object moving through the door opening that might cause damage to the edges of the door. The edge guard would need to be ordered and manufactured as a square angle or beveled, depending on the door edge.

PROPERTIES

Finishes

Door edge guards are typically available in a limited number of architectural finishes and should comply with the current version of ANSI/BHMA A156.18 American National Standard for Materials and Finishes.

Grades

Door edge guards are not categorized in grades but should comply with standards in Workmanship as described for Product Category J200 in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

Door edge guards are available in different duties, which depend on the thickness and type of material used.

Materials

Door edge plates are typically manufactured of aluminum, brass, or stainless steel material. Door edge guards should comply with Materials for Product Category J200 as described in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

TYPES

Door edge guards are available in various types. The current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim describes armor plates as Product Category J200.

Mortise

Mortise edge guards are mortised into the door.

ANGLE

This door edge configuration is mortised into the edge of the door, making it flush with the door. It is manufactured for a square-edged door and wraps around the edge and one face of the door. If a separate face protection plate is used, such as an armor plate, it butts up against or installs over the edge of the door edge guard. J204 is categorized in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

This door edge configuration is mortised into the edge of the door, making it flush with the door. It is manufactured for a bevel-edged door and wraps around the edge and one face of the door. If a

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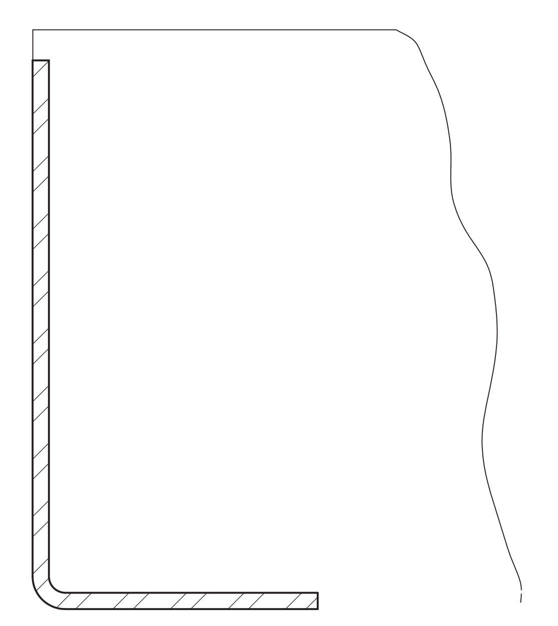




FIGURE 6.3 Door Edge Guard Square Angle
(Source: Courtesy of Rockwood® Manufacturing Company)

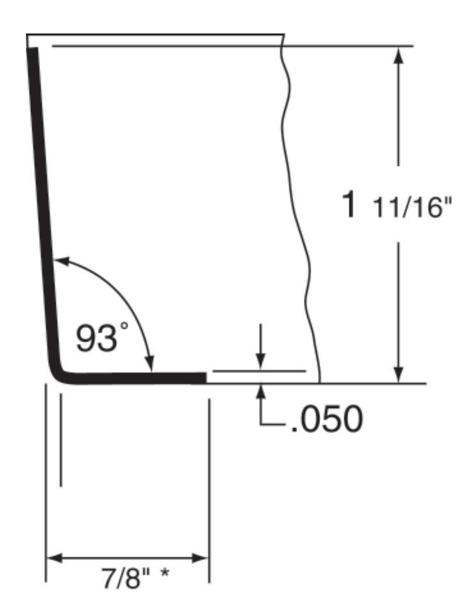


FIGURE 6.4 Door Edge Guard Beveled Angle
(Source: Courtesy of Rockwood® Manufacturing Company)

separate face protection plate is used, such as an armor plate, it butts up against or install over the edge of the door edge guard. J205 is categorized in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

CAP

This door edge configuration is mortised into the edge of the door, making it flush with the door. It is manufactured for a square edged door and wraps around the edge and both faces of the door. If a separate face protection plate is used, such as an armor plate, it butts up against or installs over the edge of the door edge guard. J210 is categorized in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

One cap door edge configuration is mortised into the edge of the door, making it flush with the door. It is manufactured for a bevel-edged door and wraps around the edge and both faces of the door. If a separate face protection plate is used, such as an armor plate, it butts up against or installs over the edge of the door edge guard. J211 is categorized in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Another cap door edge configuration is mortised into the edge of the door, making it flush with the door. It is manufactured for a round- or bull-nose-edged door and wraps around the edge and both faces of the door. If a separate face protection plate is used, such as an armor plate, it butts up against or installs over the edge of the door edge guard. J212 is categorized in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Nonmortise

Nonmortise edge guards are surface-mounted on the edge of the door.

ANGLE

One angle door edge configuration is surface-mounted for a square-edged door and wraps around the edge and one face of the door. A separate face protection plate, such as an armor plate, fits under a

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raise at the edge of the door edge guard. J201 is categorized in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Another angle door edge configuration is surface-mounted for a bevel-edged door and wraps around the edge and one face of the door. A separate face protection plate, such as an armor plate, fits under a raise at the edge of the door edge guard. J201 is categorized in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

CAP

This door edge configuration is surface-mounted for a square-edged door and wraps around the edge and both faces of the door. Separate face protection plates, such as armor plates, fit under the raises at both edges of the door edge guard. J207 is categorized in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Some manufacturers might have the option to add an overlapping astragal to this door edge type for pairs of doors.

Another door edge configuration is surface-mounted for a bevel edged door and wraps around the edge and both faces of the door. Separate face protection plates, such as armor plates, fit under the raises at both edges of the door edge guard. J208 is categorized in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Some manufacturers might have the option to add an overlapping astragal to this door edge type for pairs of doors.

Another door edge configuration is surface-mounted for a round- or bull-nose-edged door and wraps around the edge and both faces of the door. Separate face protection plates, such as armor plates, fit under both raised edges of the door edge guard. J209 is categorized in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

SIZES

Height and Width

Door edge guards are available in standard door heights but can be specified for a custom net door height. Door edge guards are typically available for 1 3/4-inch-thick doors but can be manufactured for other thicknesses, depending on what is available from the the manufacturer.

Thickness

Door edge guard materials are typically manufactured in a. 050-inch thickness.

OPTIONS

Anti-Microbial Coating

Door edge guards are available with an optional anti-microbial coating. The coating is a silver ion–based clear coating that helps stop the spread of bacteria. Although there are silver ions, they are not visible to the eye and a brass or bronze finish shows its true color through the coating. Silver has been used throughout history to help reduce the spread of bacteria and infection: Why not put it on doors and hardware that is touched over and over again by numerous people in a day?

Countersunk Holes

Door edge guards might not be manufactured in standard versions with countersunk holes and this should be specified if desired. If the holes are not countersunk, the head of the screws will protrude off

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the face of the door, whereas countersunk holes will allow the head of the screws to install flush with the face of the armor plate.

Cutouts

Some doors with door edge guards installed might have flushbolts, locksets, lock strikes, hinges, or other conflicting hardware where a door edge guard might be installed. Therefore, manufacturers will make special cutouts if ordered properly. If not, field cutting might not give the accuracy required for the conflicting hardware devices to operate properly or at all.

Labeling

Some manufacturers have tested their door edge guards to be installed on fire rated doors up to three hours.

Shapes

As described in the Types section, an edge guard could be square edged, bevel edged, round, or bull-nosed, and wrap around the side and either one or both faces of the door. Both face and wrap-around door edge guards might have the option to add an astragal.

QUANTITIES

Door edge guards are furnished in single quantities and should be specified one for each door edge required.

APPLICATIONS

Mortised

Door edge guards are available to be mortised into the edge and face or faces of the edge of the door.

Surface Mounted

Door edge guards are available to be surface-mounted onto the edge and face or faces of the edge of the door.

INSTALLATION

Door edge guards are typically installed at the edge of a door and wrap around either one or both faces of the door.

Fasteners

Door edge guards are typically installed with screw fasteners, which are available for installation on wood or metal door materials. Door edge guards would typically have countersunk screw holes, which should comply with ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Locations

Door edge guards should be installed at the edge of the entire height of a door, on either the hanging or latching side, or both.

Preparations

Door edge guard preparations are not required if self-tapping screws are not being used and the screw holes can be drilled and tapped in the field by the installer.

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KICKPLATES

Also Known As: Kick Protection Plate, Kick Protective Plate, Protection Plate, Protective Plate

DESCRIPTION

Kickplates are typically installed on the bottom half of doors that require protection from an object moving through the door opening that might cause damage to the door surface. Protection plates have different names depending on their sizes, and kickplates are typically any size above 6 inches and up to 12 inches in height.

PROPERTIES

Finishes

Kickplates are typically available in a limited number of architectural finishes and should comply with the current version of ANSI/BHMA A156.18 American National Standard for Materials and Finishes.

Grades

Kickplates are not categorized in grades but should comply with standards in Workmanship as described for Product Category J100 in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

Kickplates are available in different duties, which depend on the thickness and type of material used.

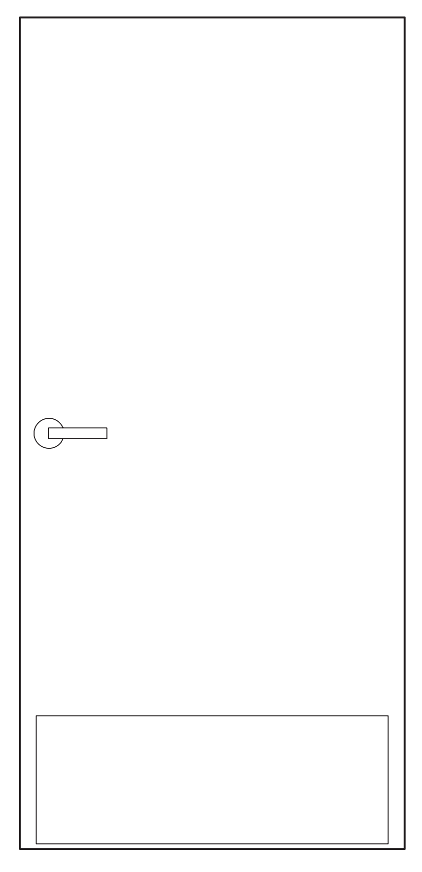


FIGURE 6.5 Kickplate
(Source: Courtesy of Rockwood® Manufacturing Company)

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METAL

Standard Duty

Standard duty metal kickplates are manufactured from a minimum .050-inch-thick material according to ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Heavy Duty

Heavy-duty metal kickplates are manufactured from a minimum .062-inch-thick material.

Extra Heavy Duty

DIAMOND PLATE

A diamond plate extra heavy–duty kickplate, which is a smooth surface similar to standard metal armor plates, is manufactured from .125-inch-thick material with a raised diamond plate surface.



FIGURE 6.6 Diamond Plate Surface
(Source: Courtesy of Rockwood® Manufacturing Company)

Flat Surface Plate

A flat surface plate extra heavy–duty kickplate, which is a smooth surface similar to standard metal armor plates, is manufactured from .125-inch-thick material.

PLASTIC

Flexible PVC or Acrylic Alloy

Flexible PVC or acrylic alloy plastic kickplates are manufactured at a minimum of .060 inches thick, according to ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Laminate

Standard duty plastic kickplates are manufactured at a minimum of 1/8-inches thick, according to ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Materials

Depending on the material, kickplates can be manufactured of aluminum, brass, plastic, or stainless steel. Kickplates should comply with Materials for Product Category J100 as described in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

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TYPES

Kickplates have one type, which can be manufactured from different materials, in various sizes, using different mounting methods. The current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim describes armor plates as Product Category J100.

Metal

A metal kickplate is categorized as J102 in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Plastic

A plastic kickplate is categorized as J106 in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

SIZES

Height and Width

Kickplates are typically specified in height by width and are installed 1 1/2 inches less than the door width on the pull side of the door and 2 inches less than the door width on the push side of the door. These dimensions are for doors installed in standard door frames that have standard 5/8-inch stops projecting into the door opening clear width. The deduction of 2 inches on the push side is so the plate does not bind with the frame stops and the deduction of 1 1/2 inches on the pull side is so the fasteners have sufficient space to secure to.

Although the sizes may vary depending on interpretation, kickplates are typically any height over 6 inches, which is the typical maximum height of a mop plate, and 12 inches.

Thickness

Standard kickplates are available in various thicknesses depending on the intended use and frequency.

OPTIONS

Anti-Microbial Coating

Kickplates are available with an optional anti-microbial coating. The coating is a silver ion–based clear coating that helps stop the spread of bacteria. Although there are silver ions, they are not visible to the eye and a brass or bronze finish shows its true color through the coating. Silver has been used throughout history to help reduce the spread of bacteria and infection: Why not put it on doors and hardware that is touched over and over again by numerous different people in a day?

Countersunk Holes

Kickplates might not be manufactured standard with countersunk holes and this should be specified if desired. If the holes are not countersunk, the head of the screws will protrude off the face of the door, whereas countersunk holes will allow the head of the screws to install flush with the face of the armor plate.

Cutouts

Some doors might have louvers or other conflicting hardware where a kickplate might be installed. Therefore, manufacturers will make special cutouts, if ordered properly. If not, field cutting might not give the accuracy required for the conflicting hardware devices to operate properly or at all.

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Decorative

Some manufacturers incorporate design into their kickplates, giving them more than a rectangular look and aesthetic.

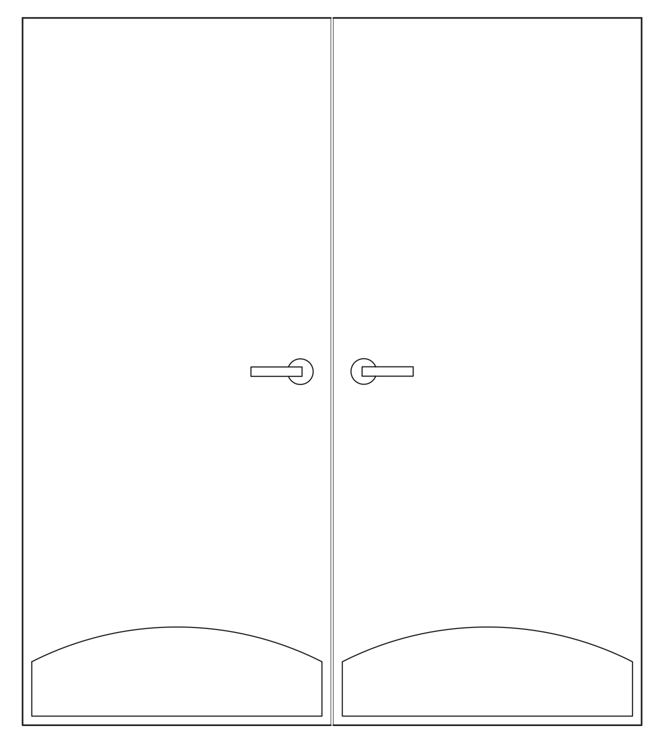


FIGURE 6.7 Decorative Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

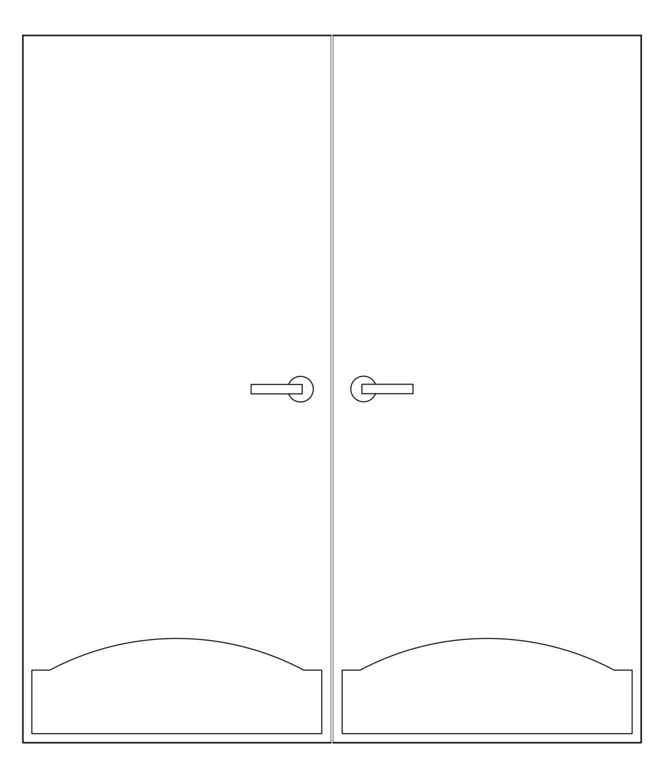


FIGURE 6.8 Decorative Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

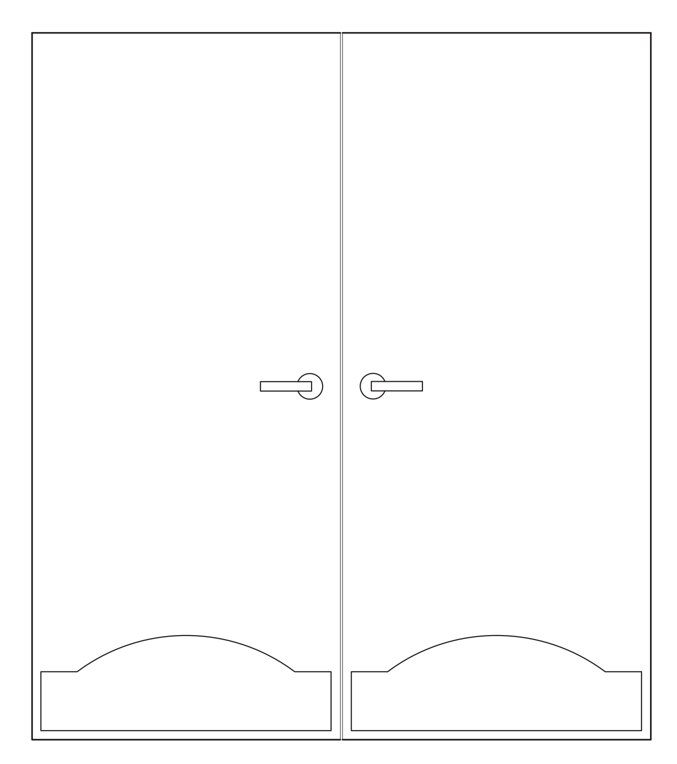


FIGURE 6.9 Decorative Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

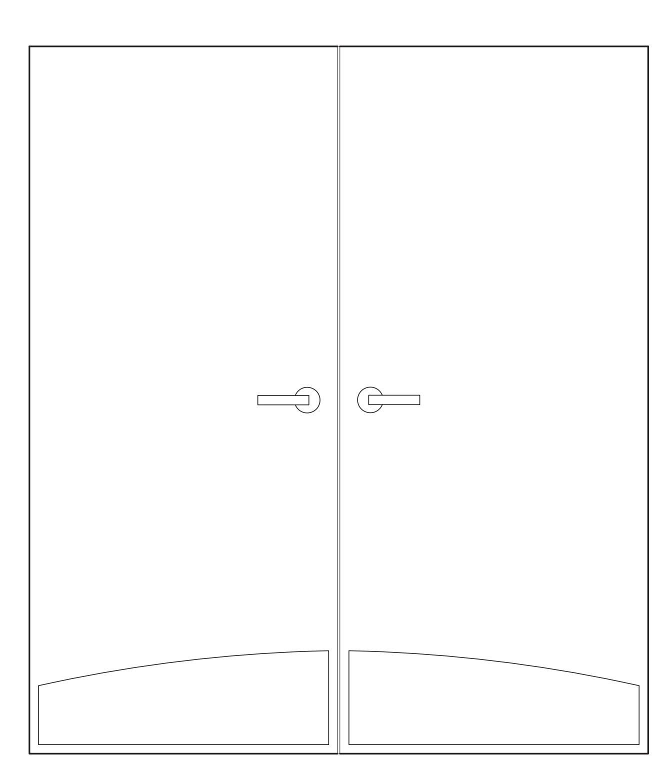


FIGURE 6.10 Decorative Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

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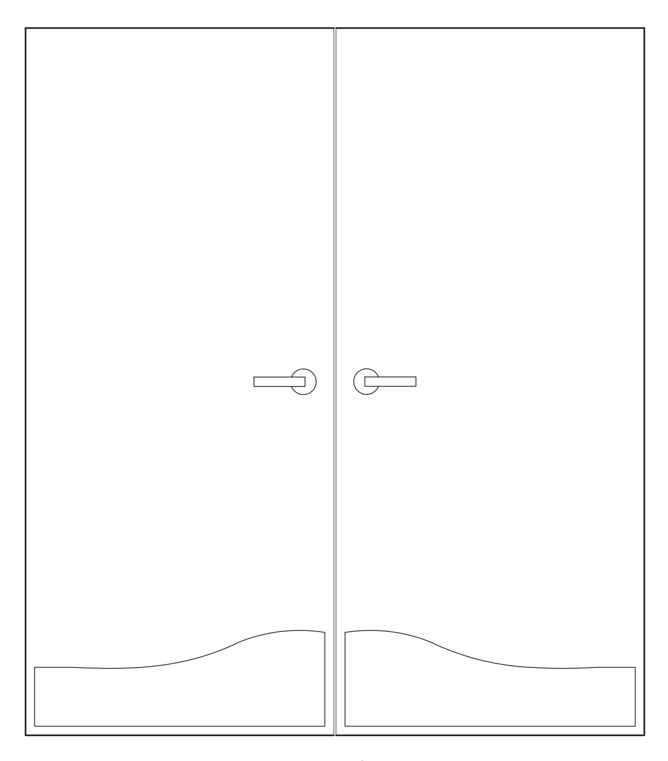


FIGURE 6.11 Decorative Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

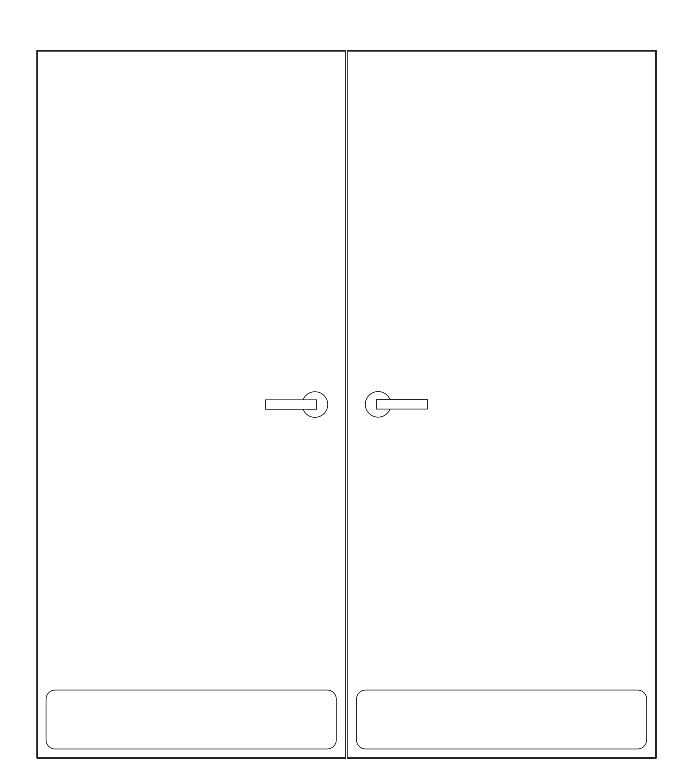


FIGURE 6.12 Decorative Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

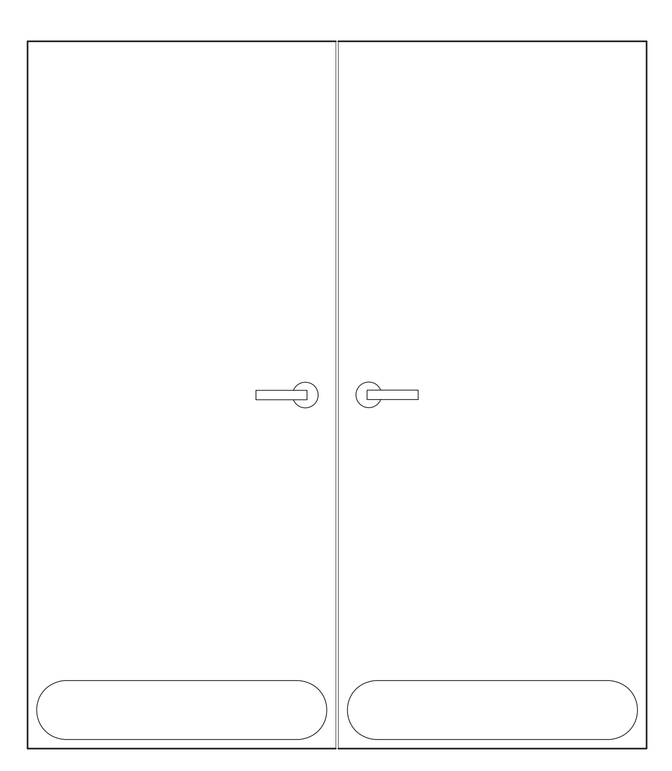


FIGURE 6.13 Decorative Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

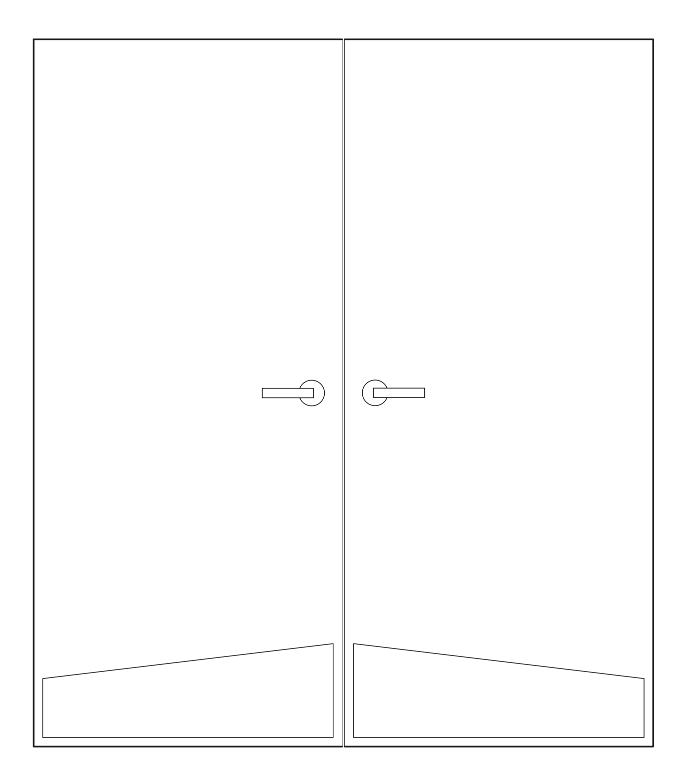


FIGURE 6.14 Decorative Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

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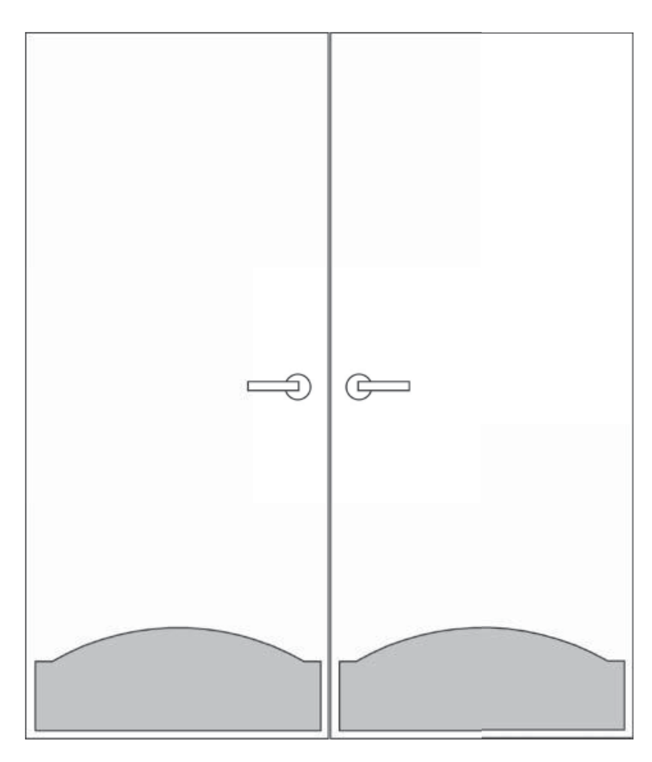


FIGURE 6.15 Decorative Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

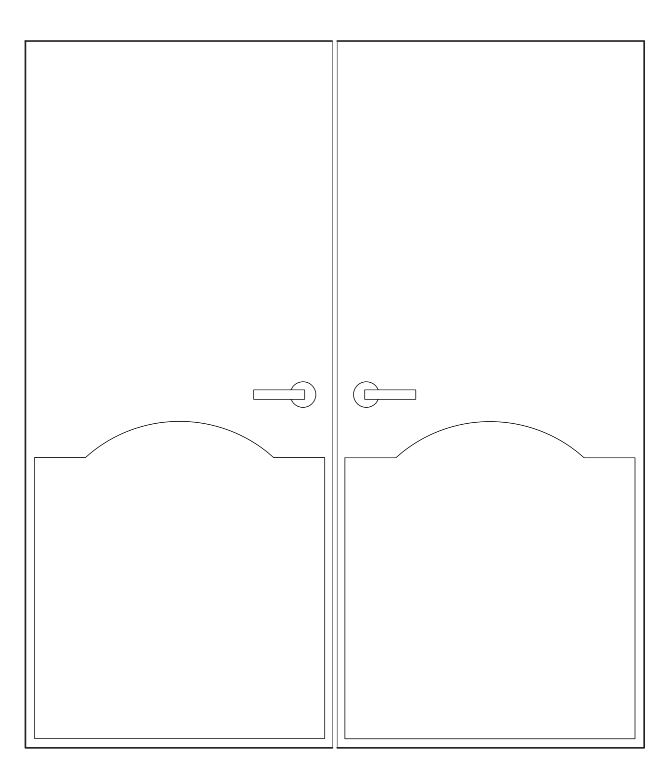


FIGURE 6.16 Decorative Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

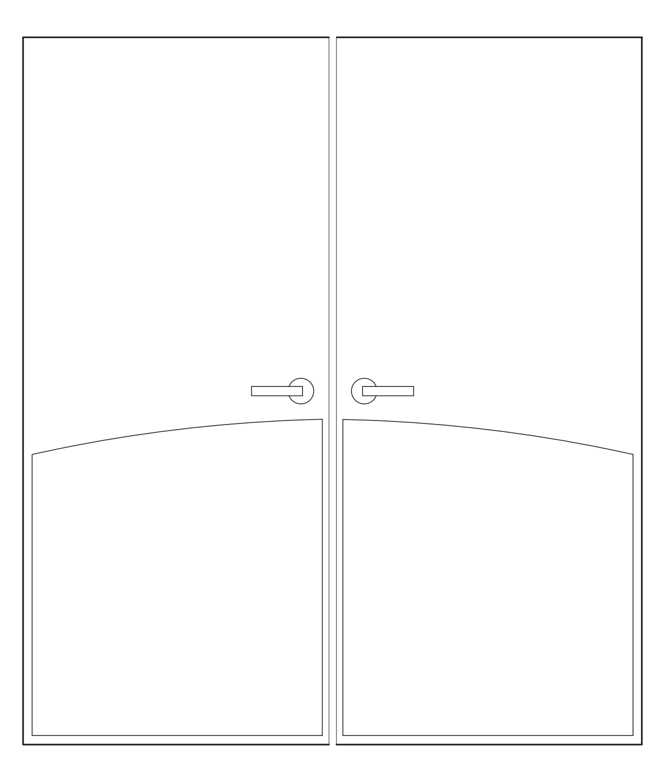


FIGURE 6.17 Decorative Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

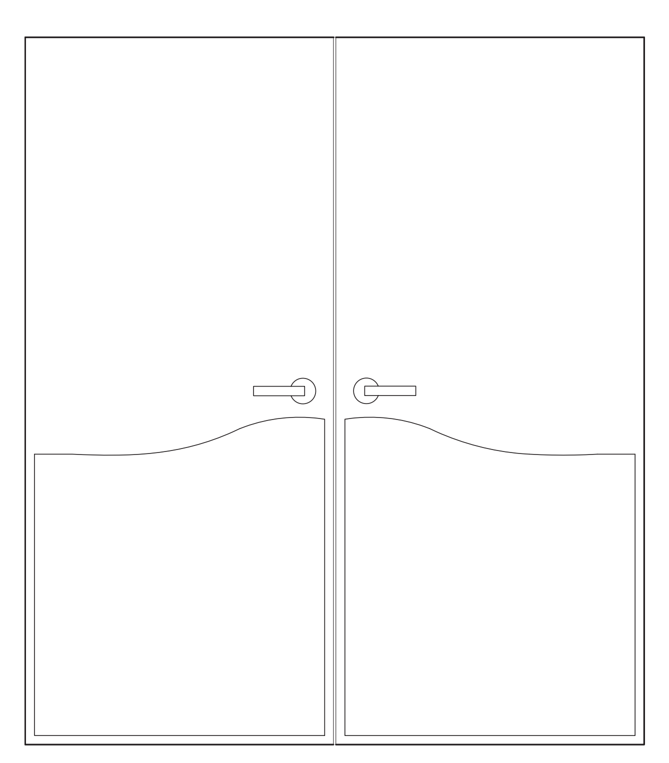


FIGURE 6.18 Decorative Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

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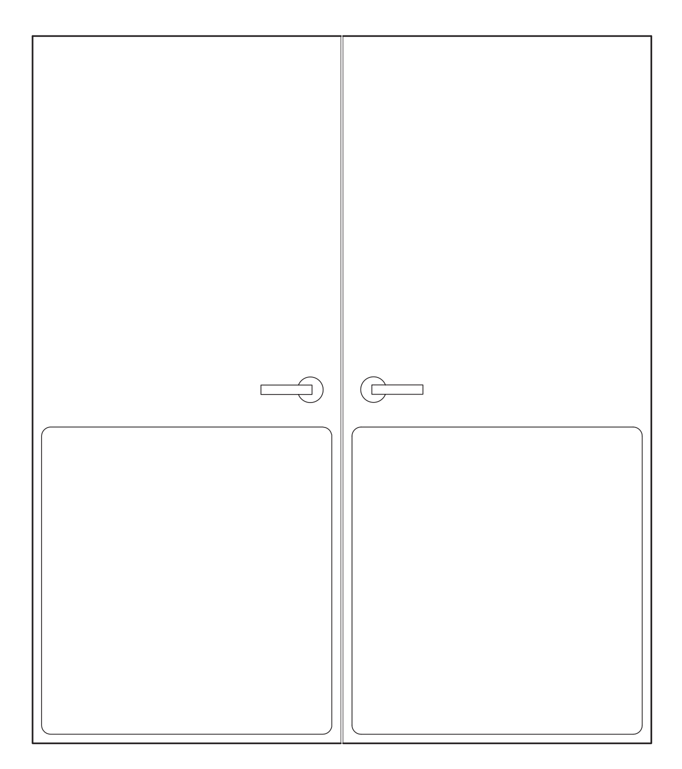


FIGURE 6.19 Decorative Protection

(Source: Courtesy of Rockwood® Manufacturing Company)

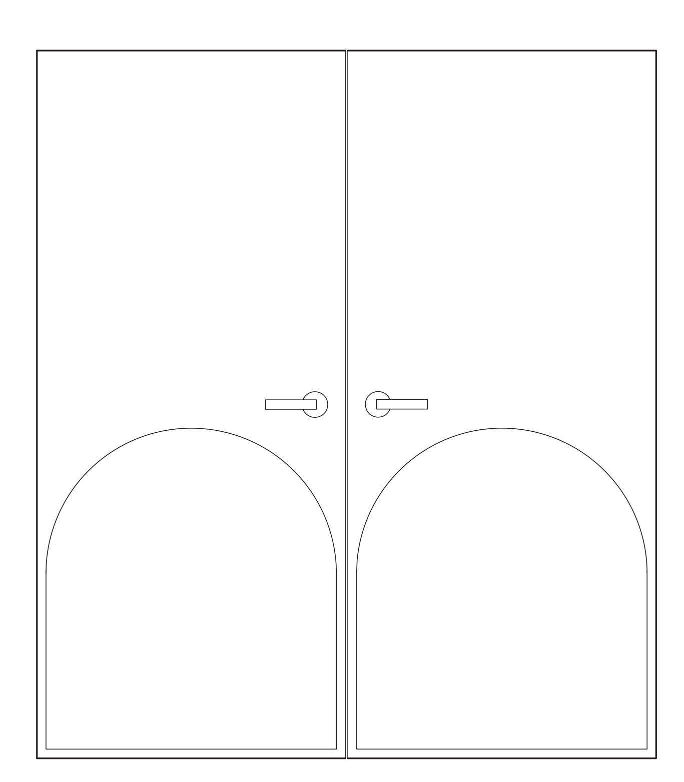


FIGURE 6.20 Decorative Protection Plate

(Source: Courtesy of Rockwood® Manufacturing Company)

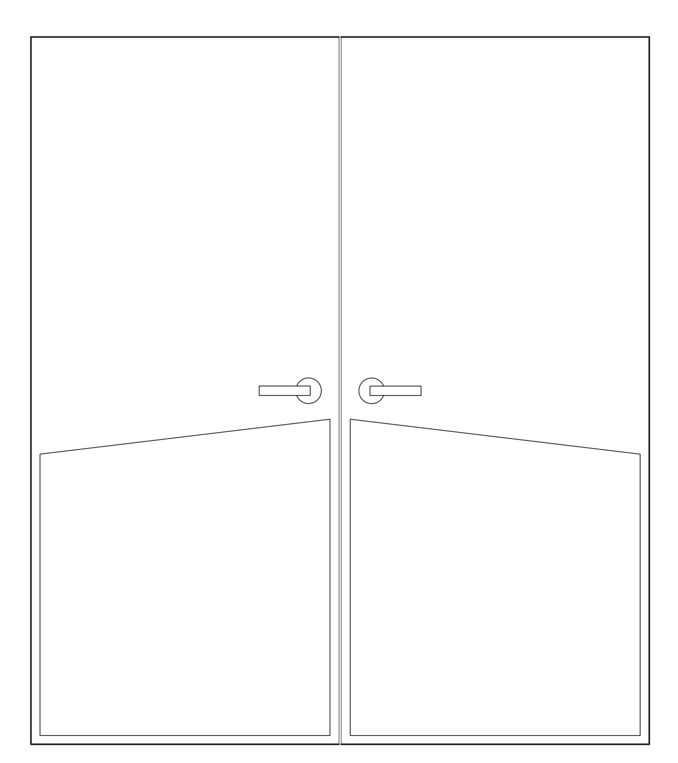


FIGURE 6.21 Decorative Protection Plate

(Source: Courtesy of Rockwood® Manufacturing Company)

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Edges

BEVELED

Kickplates have the option for beveled edges. In addition to being an aesthetic preference, beveled edges are softened at the end to a 45-degree angle back to the door instead of having a 90-degree square edge. Although four beveled edges are available as an option, three beveled edges are also available for those who are not particular about the bottom edge. The bottom edge of a kickplate is typically flush with the bottom of the door and is beveled, leaving it at a square-edged, 90-degree angle.

SQUARE

Kickplates might have the option for four square edges. As described above, three beveled edges are an option, leaving at least one, the bottom edge of the armor plate, square edged. In addition to being an aesthetic preference, square edges are a 90-degree cut back to the door. Caution should be used, however, as the edges can be sharp.

Engraving

Manufacturers have the ability to engrave kickplates. Engraving requests might be a room number in an office, educational, or healthcare facility, or possibly an exit sign with photoluminescent properties.

Labeling

Until a change in codes, which forced a change in manufacturing and testing requirements, protection plates higher than 16 inches from the bottom edge of the door could not be installed on fire rated doors. Now, some manufacturers have tested their plates, so they can be installed on fire rated doors no matter what the height of the plate or fire label of the door.

Shapes

A typical kickplate is rectangular with square corners, but some manufacturers offer shaped protection plates, which allow for curves and designs to be incorporated into the shape.

QUANTITIES

Kickplates are furnished in single quantities and should be specified one for each door surface required.

APPLICATIONS

Surface Mounted

Kickplates are surface-mounted, typically on the push side face of a door.

Angle Plate

BOTTOM

An angle plate also covers one or two sides of the door in addition to the face of the door.

ONE SIDED

A one-sided angle plate wraps around one side edge of the door in addition to the face of the door.

TWO SIDED

A two-sided angle plate wraps around both side edges of the door in addition to the face of the door.

INSTALLATION

Kickplates are typically installed on the push side face of a door.

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Fasteners

Kickplates are typically installed with screw fasteners, which are available for installation on wood or metal door materials. A kickplate typically has countersunk screw holes around the perimeter, which should comply with ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

COUNTERSUNK

Kickplates might not be manufactured standard with countersunk holes and this should be specified if desired. If the holes are not countersunk, the head of the screws will protrude off the face of the door, whereas countersunk holes will allow the head of the screws to install flush with the face of the kickplate.

SELF-ADHESIVE

Kickplates are available with a self-adhesive double-faced tape option in lieu of screw fasteners. If self-adhesive tape is used, the kickplate typically will not have any screw holes as with a typical installation.

SURFACE MOUNTED

Kickplates might not be manufactured standard with countersunk holes. The screws are installed surface-mounted on the plate with the head of the screws protruding off the face of the kickplate.

Locations

Kickplates should be installed on the bottom half of the push side of a door surface to protect the door from objects moving through the door opening that might cause damage to the door surface.

Preparations

Kickplate preparations are not required if self-tapping screws are not being used, and the screw holes are drilled and tapped in the field by the installer.

MOP PLATES

Also Known As: Mop Protection Plate, Mop Protective Plate, Protection Plate, Protective Plate

Description

Mop plates are typically installed on the bottom half of doors that require protection from an object moving through the door opening that might cause damage to the door surface. Protection plates have different names, depending on their sizes, and mop plates are typically any size up to 6 inches in height.

PROPERTIES

Finishes

Mop plates are typically available in a limited number of architectural finishes and should comply with the current version of ANSI/BHMA A156.18 American National Standard for Materials and Finishes.

Grades

Mop plates are not categorized in grades but should comply with standards in Workmanship as described for Product Category J100 in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

Mop plates are available in different duties, which depend on the thickness and type of material used.

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METAL

Standard Duty

Standard duty metal mop plates are manufactured from a minimum .050-inch-thick material according to ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Heavy Duty

Heavy-duty metal mop plates are manufactured from a minimum .062-inch-thick material.

Extra Heavy Duty

DIAMOND PLATE

A diamond plate extra heavy–duty mop plate, which has a smooth surface similar to that of standard metal armor plates, is manufactured from .125-inch-thick material with a raised diamond plate surface.



FIGURE 6.22 Diamond Plate Surface
(Source: Courtesy of Rockwood® Manufacturing Company)

FLAT SURFACE PLATE

A flat surface plate extra heavy–duty mop plate, which has a smooth surface similar to that of standard metal armor plates, is manufactured from .125-inch-thick material.

PLASTIC

Flexible PVC or Acrylic Alloy

Flexible PVC or acrylic alloy plastic mop plates are manufactured at a minimum .060-inches thick according to ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Laminate

Standard duty laminate mop plates are manufactured at a minimum 1/8-inch thick according to ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Materials

Depending on the material, mop plates can be manufactured of aluminum, brass, plastic, or stainless steel. Mop plates should comply with Materials for Product Category J100 as described in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

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TYPES

Mop plates have one type, which can be manufactured from different materials, at various sizes, and using different mounting methods. The current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim describes armor plates as Product Category J100.

Metal

A metal mop plate is categorized as J103 in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Plastic

A plastic mop plate is categorized as J107 in ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

SIZES

Height and Width

Mop plates are typically specified in height by width and are installed 1 1/2 inches less than the door width on the pull side of the door and 2 inches less than the door width on the push side of the door. These dimensions are for doors installed in standard door frames that have standard 5/8-inch stops projecting into the door opening clear width. The deduction of 2 inches on the push side is so the plate does not bind with the frame stops and the deduction of 1 1/2 inches on the pull side is so the fasteners have sufficient space to secure to.

Although the sizes may vary depending on interpretation, mop plates are typically any height up to 6 inches, which is the typical maximum height of a mop plate.

Thickness

Standard mop plates are available in various thicknesses depending on the intended use and frequency.

OPTIONS

Anti-Microbial Coating

Mop plates are available with an optional anti-microbial coating. The coating is a silver ion–based clear coating that helps stop the spread of bacteria. Although there are silver ions, they are not visible to the eye and a brass or bronze finish shows its true color through the coating. Silver has been used throughout history to help reduce the spread of bacteria and infection: Why not put it on doors and hardware that is touched over and over again by numerous people in a day?

Countersunk Holes

Mop plates might not be manufactured standard with countersunk holes and these should be specified if desired. If the holes are not countersunk, the head of the screws will protrude off the face of the door, whereas countersunk holes will allow the head of the screws to install flush with the face of the armor plate.

Cutouts

Some doors might have louvers or other conflicting hardware where a mop plate might be installed. Therefore, manufacturers will make special cutouts, if ordered properly. If not, field cutting might not give the accuracy required for the conflicting hardware devices to operate properly or at all.

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Edges

BEVELED

Mop plates have the option for beveled edges. In addition to being an aesthetic preference, beveled edges are softened at the end to a 45-degree angle back to the door instead of a 90-degree square edge. Although four beveled edges are available as an option, three beveled edges are also available for those who are not particular about the bottom edge. The bottom edge of a mop plate is typically flush with the bottom of the door and is beveled, leaving it at a square edged, 90-degree angle.

SQUARE

Mop plates might have the option for all four square edges. As described above, three beveled edges are an option, leaving at least one, the bottom edge of the armor plate, square edged. In addition to being an aesthetic preference, square edges are a 90-degree cut back to the door. Caution should be used, however, as the edges can be sharp.

Engraving

Manufacturers have the ability to engrave mop plates. An engraving request might be a room number in an office, educational, or healthcare facility, or possibly an exit sign with photoluminescent properties.

Labeling

Until there was a change in codes, which forced a change in manufacturing and testing requirements, protection plates higher than 16 inches from the bottom edge of the door could not be installed on fire rated doors. Now, some manufacturers have tested their plates, so they can be installed on fire rated doors no matter what the height of the plate or fire label of the door.

Shapes

A typical mop plate is rectangular with square corners, but some manufacturers offer shaped protection plates, which allow for curves and designs to be incorporated into the shape.

QUANTITIES

Mop plates are furnished in single quantities and should be specified one for each door surface required.

APPLICATIONS

Surface Mounted

Mop plates are surface-mounted, typically on the push side face of a door.

Angle Plate

BOTTOM

An angle plate also covers one or two sides of the door in addition to the face of the door.

ONE SIDED

A one-sided angle plate wraps around one side edge of the door in addition to the face of the door.

TWO SIDED

A two-sided angle plate wraps around both side edges of the door in addition to the face of the door.

INSTALLATION

Mop plates are typically installed on the push side face of a door.

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Fasteners

Mop plates are typically installed with screw fasteners, which are available for installation on wood or metal door materials. A mop plate typically has countersunk screw holes around the perimeter, which should comply with ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

COUNTERSUNK

Mop plates might not be manufactured standard with countersunk holes and these should be specified if desired. If the holes are not countersunk, the head of the screws will protrude off the face of the door, whereas countersunk holes will allow the head of the screws to install flush with the face of the mop plate.

SELF-ADHESIVE

Mop plates are available with a self-adhesive double-faced tape option in lieu of screw fasteners. If self-adhesive tape is used, the mop plate typically does not have any screw holes as with a typical installation.

SURFACE MOUNTED

Mop plates might not be manufactured standard with countersunk holes. The screws would be installed surface-mounted on the plate with the head of the screws protruding off the face of the mop plate.

Locations

Mop plates should be installed on the bottom half of the pull side of a door surface to protect the door from mopping and cleaning liquids that might cause damage to the door's surface.

Preparations

Mop plate preparations are not required if self-tapping screws are not being used, and the screw holes are drilled and tapped in the field by the installer.

STRETCHER PLATES

Also Known As: Stretcher Protection Plate, Stretcher Protective Plate, Protection Plate, Protective Plate

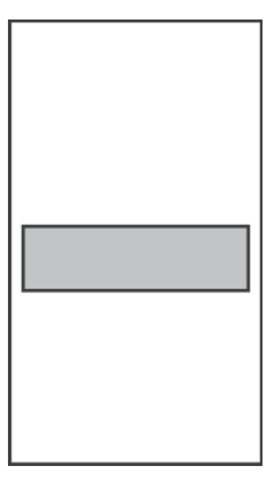


FIGURE 6.23 Stretcher Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

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DESCRIPTION

Stretcher plates are typically installed across the middle of doors that require protection from a stretcher hitting the door surface and damaging it. They could of course be used to protect the door from other objects that might only hit in the center of the door face as a stretcher would. Protection plates have different names depending on their sizes, and they are typically any size up to 16 inches in height.

PROPERTIES

Finishes

Stretcher plates are typically available in a limited number of architectural finishes and should comply with the current version of ANSI/BHMA A156.18 American National Standard for Materials and Finishes.

Grades

Stretcher plates are not categorized in grades but should comply with standards in Workmanship as described for Product Category J100 in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

Stretcher plates are available in different duties, which depend on the thickness and type of material used.

METAL

Standard Duty

Standard duty metal stretcher plates are manufactured from a minimum .050-inch-thick material according to ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Heavy Duty

Heavy-duty metal stretcher plates are manufactured from a minimum .062-inch-thick material.

Extra Heavy Duty

DIAMOND PLATE

A diamond plate extra heavy–duty stretcher plate, which has a smooth surface similar to that of standard metal armor plates, is manufactured from .125-inch-thick material with a raised diamond plate surface.



FIGURE 6.24 Diamond Plate Surface
(Source: Courtesy of Rockwood® Manufacturing Company)

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FLAT SURFACE PLATE

A flat surface plate extra heavy–duty stretcher plate, which has a smooth surface similar to that of standard metal armor plates, is manufactured from .125-inch-thick material.

PLASTIC

Flexible PVC or Acrylic Alloy

Flexible PVC or acrylic alloy plastic stretcher plates are manufactured at a minimum .060-inches thick according to ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Laminate

Standard-duty plastic stretcher plates are manufactured at a minimum 1/8-inch thick according to ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

Materials

Depending on the material, stretcher plates can be manufactured of aluminum, brass, plastic, or stainless steel. Stretcher plates should comply with Materials for Product Category J100 as described in the current version of ANSI/BHMA A156.6 American National Standard for Architectural Door Trim.

Types

Stretcher plates have one type, which can be manufactured from different materials, in various sizes, using different mounting methods.

SIZES

Height and Width

Stretcher plates are typically specified in height by width and are installed 1 1/2 inches less than the door width on the pull side of the door and 2 inches less than the door width on the push side of the door. These dimensions are for doors installed in standard door frames that have standard 5/8-inch stops projecting into the door opening clear width. The deduction of 2 inches on the push side is so the plate does not bind with the frame stops and the deduction of 1 1/2 inches on the pull side is so the fasteners have sufficient space to secure to.

Although the sizes may vary depending on interpretation, stretcher plates are typically any height up to 6 inches, which is the typical maximum height of a mop plate.

Thickness

Standard stretcher plates are available in various thicknesses depending on the intended use and frequency of use.

OPTIONS

Anti-Microbial Coating

Stretcher plates are available with an optional anti-microbial coating. The coating is a silver ion–based clear coating that helps stop the spread of bacteria. Although there are silver ions, they are not visible to the eye and a brass or bronze finish shows its true color through the coating. Silver has been used throughout history to help reduce the spread of bacteria and infection: Why not put it on doors and hardware that is touched over and over again by numerous people in a day?

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Countersunk Holes

Stretcher plates might not be manufactured standard with countersunk holes and these should be specified if desired. If the holes are not countersunk, the head of the screws will protrude off the face of the door, whereas countersunk holes will allow the head of the screws to install flush with the face of the armor plate.

Cutouts

Some doors might have louvers or other conflicting hardware where a mop plate might be installed. As such, manufacturers will make special cutouts if ordered properly. If not, field cutting might not give the accuracy required for the conflicting hardware devices to operate properly or at all.

Edges

BEVELED

Stretcher plates have the option for beveled edges. In addition to being an aesthetic preference, beveled edges are softened at the end to a 45-degree angle back to the door instead of a 90-degree square edge. Although four beveled edges are available as an option, three beveled edges are also available for those who are not particular about the bottom edge. The bottom edge of a mop plate is typically flush with the bottom of the door and is beveled, leaving it at a square-edged, 90-degree angle.

SQUARE

Stretcher plates might have the option for all four square edges. As described above, three beveled edges are an option, leaving at least one, the bottom edge of the armor plate, square edged. In addition to being an aesthetic preference, square edges are a 90-degree cut back to the door. Caution should be used, however, as the edges can be sharp.

Engraving

Manufacturers have the ability to engrave stretcher plates. An engraving request might be a room number in an office, educational, or healthcare facility, or possibly an exit sign with photoluminescent properties.

Labeling

Until a change in codes occurred, which forced a change in manufacturing and testing requirements, protection plates higher than 16 inches from the bottom edge of the door could not be installed on fire rated doors. Now, some manufacturers have tested their plates, so they can be installed on fire rated doors no matter what the height of the plate or fire label of the door.

Shapes

A typical stretcher plate is rectangular with square corners, but some manufacturers offer shaped protection plates, which allow for curves and designs to be incorporated into the shape.

QUANTITIES

Stretcher plates are furnished in single quantities and should be specified one for each door surface required.

APPLICATIONS

Surface Mounted

Stretcher plates are typically surface-mounted on the push side face of a door.

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INSTALLATION

Stretcher plates are typically installed on the push side face of a door.

Fasteners

Stretcher plates are typically installed with screw fasteners, which are available for installation on wood or metal door materials. A stretcher plate typically has countersunk screw holes around the perimeter, which should comply with ANSI/BHMA A156.6 American National Standard for Architectural Door Trim, 2005.

COUNTERSUNK

Stretcher plates might not be manufactured standard with countersunk holes and these should be specified if desired. If the holes are not countersunk, the head of the screws will protrude off the face of the door, whereas countersunk holes will allow the head of the screws to install flush with the face of the stretcher plate.

SELF-ADHESIVE

Stretcher plates are available with a self-adhesive double-faced tape option in lieu of screw fasteners. If self-adhesive tape is used, the stretcher plate typically will not have any screw holes as with a typical installation.

SURFACE MOUNTED

Stretcher plates might not be manufactured standard with countersunk holes. The screws would be installed surface-mounted on the plate with the head of the screws protruding off of the face of the stretcher plate.

Locations

Stretcher plates should be installed on the bottom half of the pull side of a door surface to protect the door from mopping and cleaning liquids that might cause damage to the door's surface.

Preparations

Stretcher plate preparations are not required if self-tapping screws are not being used, and the screw holes would be drilled and tapped in the field by the installer.

REFERENCES

Codes and standards are available to set the minimum requirements of door openings (see the Introduction of this book for more information). Some jurisdictions have specific codes and standards, which were either modified from another existing code or created for their own use.

Language and section numbers can change slightly or drastically when the codes are updated. Look for an outline, if available, of the changes that took place in the respective update.

CODES

International Building Code (IBC)

The following are chapter of a modified or fully adopted version of the International Building Code that refer to protection plates and trim items or door hardware in general:

- Chapter 7: Fire and Smoke Protection Features
  - Section 716 Opening Protectives

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- Chapter 10: Means of Egress
  - Section 1008: Doors, Gates and Turnstiles
- Chapter 17: Special Inspections and Tests
  - Section 1710 Preconstruction Load Tests
- Chapter 26: Plastic
  - Section 2603 Foam Plastic Insulation

National Fire Protection Association (NFPA) 101: Life Safety Code

The following is a chapter of a modified or fully adopted version of the NFPA 101: Life Safety Code that refers to protection plates and trim items or door hardware in general:

- Chapter 7: Means of Egress

STANDARDS

ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)

The following is a chapter of a modified or fully adopted version of the ADA Accessibility Guidelines for Buildings and Facilities, that refers to protection plates and trim items or door hardware in general:

- Chapter 4: Accessible Routes

ASTM International (ASTM)

There are hundreds of ASTM International testing standards that are related to doors and door hardware, from material and assembly testing to installation and application testing.

Door and Hardware Institute (DHI)

The following are technical documents available for reference that refer to protection plates and trim items or door hardware in general:

- Abbreviations and Symbols
- Basic Architectural Hardware
- Hardware for Healthcare Facilities
- Installation Guide for Doors and Hardware
- Processing Hardware for Custom Aluminum Entrances
- Recommended Locations for Builders Hardware Custom Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Flush Wood Doors
- Recommended Procedures for Processing Hardware Schedules and Templates
- Sequence and Format for the Hardware Schedule
- Tech-Talk ASD-1 Aluminum Storefront Doors
- Tech-Talk PH-1 Protective Hardware
- Tech-Talk SP-1 Hardware Specification Writing

International Code Council A117.1 Accessible and Usable Buildings and Facilities, (ICC)

The following is a chapter of a modified or fully adopted version of the ICC A117.1 Accessible and Usable Buildings and Facilities that refers to protection plates and trim items or door hardware in general:

- Chapter 4: Accessible Routes

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National Fire Protection Association (NFPA)

The following are chapters of a modified or fully adopted version of NFPA 80: Standard for Fire Doors and Other Opening Protectives that refer to protection plates and trim items or door hardware in general:

- Chapter 5: Care and Maintenance
- Chapter 6: Swinging Doors with Builders Hardware
- Chapter 7: Swinging Doors with Fire Door Hardware
- Chapter 8: Horizontally Sliding Doors
- Chapter 9: Special-Purpose Horizontally Sliding Accordion or Folding Doors
- Chapter 16: Access Doors
- Chapter 19: Installation, Testing, and Maintenance of Fire Dampers
- Annex A: Explanatory Material

The following is a chapter of a modified or fully adopted version of NFPA 105: Standard for Smoke Door Assemblies and Other Opening Protectives that refers to protection plates and trim items or door hardware in general:

- Chapter 6: Installation, Testing, and Maintenance of Smoke Dampers

The following is a chapter of a modified or fully adopted version of NFPA 252: Standard Method of Fire Tests of Door Assemblies that refers to protection plates and trim items or door hardware in general:

- Chapter 5: Fire Door Assembly
- Annex B: Commentary

American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA)

The following are standards that refer to protection plates and trim items or door hardware in general:

- ANSI/BHMA A156.6 American National Standard for Architectural Door Trim
- ANSI/BHMA A156.18 American National Standard for Materials and Finishes
- ANSI/BHMA A156.115 American National Standard for Hardware Preparation in Steel Doors and Steel Frames
- ANSI/BHMA A156.115W American National Standard for Hardware Preparation in Wood Doors with Wood or Steel Frames

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Stops and Holders

If floor or door closers with overhead stops were not applied, the next step in the sequence is to apply stops and holders. Although we might have protected the door with protective plates and trim, that is not enough. The surrounding elements must also be accounted for, and we can protect the door and frame with floor or wall stops, floor or wall holders, and electromagnetic door holders.

DOOR HOLDERS

Also Known As: Door Stop, Hold Open

DESCRIPTION

Door holders can be used when a wall or floor stop is not applicable and the entire hold-open device operation needs to be on the door.

PROPERTIES

Finishes

Door holders are typically available in a limited number of architectural finishes and should comply with the current version ANSI/BHMA A156.18 American National Standard for Materials and Finishes.

Grades

Door holder stops are categorized by grades as described in the standards of Tests for Door Stops in the current version of ANSI/BHMA A156.16 American National Standard for Auxiliary Hardware. These standards describe testing in cycles, aging, bumper retention, and impact.

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Materials

Door holders can be manufactured with an aluminum, brass, bronze, stainless steel, or steel housing that is mounted to the wall with a rubber insert that is impacted by the door or door hardware. Door bumpers should comply with the Resilient Material Retention Test as described in the current version of ANSI/BHMA A156.16 American National Standard for Auxiliary Hardware.

TYPES

Door bumpers come in various types, which can be manufactured from different materials, in various sizes, and using various mounting methods. The current version of ANSI/BHMA A156.16 American National Standard for Auxiliary Hardware describes floor stops as auxiliary hardware.

Angle Stop

An angle stop is not truly a door holder, or even mounted on the door. An angle stop is installed at the head of a cased opening or framed opening to stop the door in the closed position. Because the opening has no stop as with a conventional door frame, a hardware device is required in order to stop the door in the center of the frame so that it can be secured. Another reason to stop the door is so that the door, frame, hardware, and surrounding elements do not get damaged due to improper use from the intended function of the opening.

Foot Bolt

A foot bolt-type door holder is installed at the latching end of the bottom of the door. The bolt is thrown into a strike on the floor and engaged when depressed by a foot. The device holds the door open until manually released.



FIGURE 7.1 Lever of Kick Down Door Stop
(Source: Courtesy of Scott J. Tobias)

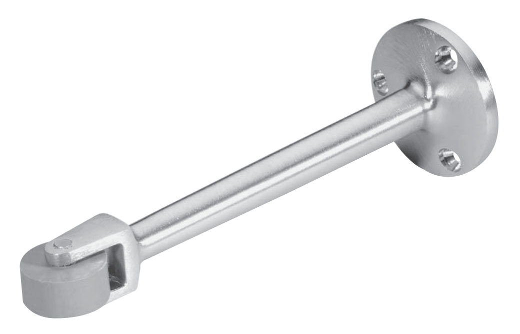


FIGURE 7.2 Roller Bumper Door Stop
(Source: Courtesy of Rockwood® Manufacturing Company)

Lever

Also known as a kick down stop, a lever door holder is installed at the latching end of the bottom of the door and has a rubber bumper at the bottom end. The lever is thrown with the foot and the rubber bumper creates pressure against the ground, holding the door in the open position. The door is held open until the lever is flipped up manually.

Plunger

A plunger door holder is installed at the latching end of the bottom of the door and has a rubber bumper at the bottom end. The plunger is thrown with the foot and the rubber bumper creates pressure against the ground, holding the door in the open position. The door is held open until the plunger is released manually.

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FIGURE 7.3 Plunger Door Stop
(Source: Courtesy of Scott J. Tobias)

Roller Bumper

This is not truly a door holder, but when mounted on the door, a roller bumper stops a door from hitting another door directly behind it, such as an apartment entrance door back to back to a closet door in the entranceway. Roller bumpers have two options, straight and offset. The straight option comes in various lengths to accommodate shorter and longer distances between doors.

SIZES

Door holders are available in various sizes and lengths to suit all size doors and different frequencies of use.

OPTIONS

There are no options to door holders other than the various options in design, finish, and installation.

QUANTITIES

Door holders are furnished in single quantities and should be specified one for each door required.

APPLICATIONS

Surface Mounted

Depending on the type, door holders may be surface-mounted on the face of the door. Some have strikes that are installed on the floor.

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INSTALLATION

Door holders are typically installed on the floor. Some have strikes that are installed on the floor.

Fasteners

Door holders are typically installed with screw fasteners, which are available for installation on wood or metal.

Locations

Door holders should be installed per the manufacturer's recommendations and where they are intended to stop the door. A door holder is installed at the locking edge on the face of the door.

Preparations

Door holder preparations typically take place in the field by the installer, including the drilling and tapping of screw holes.

ELECTROMAGNETIC DOOR HOLDERS

Also Known As: Electromagnetic Hold-Open, Magnetic Holder

DESCRIPTION

Electromagnetic door holders can be used when a door's function requires it to be held open but close at the time of a fire. This application typically is used on a fire rated door that has a function requiring it to be held open. The device is mounted on the wall or floor and an armature is mounted at the same location on the door with various holding forces available. The device is wired into the fire alarm system and when the fire alarm is triggered, the power is cut to the device, and the door releases so that it can close and latch as required by codes.

PROPERTIES

Electric

Electromagnetic door holders have fail-safe operation and are available for multiple power sources, in various voltages and currents.

FAIL SAFE

Fail-safe strikes are available to tie into a fire alarm system. This trim only locks when power is applied to the opening and unlocks when power is released. This function uses power all of the time but is necessary to meet the codes in certain situations, if electrification is necessary at the opening. The devices are manufactured differently, depending on the manufacturer and options, and can be operated by a solenoid or a motorized mechanism, which would retract and throw the bolt accordingly, or simply allow the lever or knob to be rotated to retract the latch manually.

VOLTAGE AND CURRENT

Voltage and current requirements differ by manufacturer and device. Available with alternating or direct current, and as various voltages, such as 12 VAC or DC and 24 VAC and DC, they must be coordinated properly in order to have proper operation of electrical devices.

Alternating Current

Alternating current (AC) is the typical power used in our homes and standard outlets. The current is sent to and from the device, alternating in direction. If you have ever noticed a buzzing sound at a door

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with an electric strike when power is sent to it, you are likely hearing the alternating current running through the device.

Direct Current

Direct current (DC) can eliminate the buzzing sound, and is typically a one-way current similar to that of a battery and does not create the buzzing sound.

Finishes

Door holders are typically available in a limited number of sprayed architectural finishes, which are applied to the device covers. Finishes should comply with the current version of ANSI/BHMA A156.18 American National Standard for Materials and Finishes.

Grades

Electromagnetic door holders are not categorized by grades and should meet the standards of the current version of ANSI/BHMA A156.15 American National Standard for Release Devices—Closer Holder, Electromagnetic and Electromechanical.

Materials

In addition to the internal parts of an electromagnetic door holder, the bodies and covers can be manufactured with a metal or plastic material.

TYPES

Electromagnetic door holders come in various types for various hold-open applications as described in the current version of ANSI/BHMA A156.15 American National Standard for Release Devices—Closer Holder, Electromagnetic and Electromechanical. Holding forces for standard devices can range from 40 to 55 pounds, while a heavy-duty holding force can hold around 300 pounds.

Floor Mounted

SINGLE

A single floor-mounted electromagnetic door holder rests on the floor and the wiring goes through the floor, where the existing wiring can reach it. The armature is installed on the swinging door at the same location so that the pieces can meet and hold open the door.

DOUBLE

A double floor-mounted electromagnetic door holder rests on the floor and the wiring goes through the floor, where the existing wiring can reach it. It is typically used for a bank of pairs of doors where the doors are back to back in the open position and can utilize the same device, saving wiring and installation time. The armatures are installed on the swinging doors at the same locations so that they can meet and hold open the doors.



FIGURE 7.4 Single Floor-Mounted Electromagnetic Holder
(Source: Courtesy of Rixson®)

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Wall Mounted

STANDARD DUTY

A wall-mounted standard electromagnetic door holder is mounted to the wall where the wiring can reach it. The armature is installed on the door at the same location of the swinging door so that the pieces can meet and hold open the door.

HEAVY DUTY

A heavy-duty wall-mounted electromagnetic door holder is mounted to the wall where the wiring can reach it. The armature has a hook that hooks into a recess in the device's body that is electromagnetically held in place. The hook and device are installed on the wall and door at the same location so that they can meet and hold open the door. This device can be installed on both sliding and swinging doors.



FIGURE 7.5 Single Flush-Mounted Electromagnetic Holder
(Source: Courtesy of Rixson®)

SIZES

Electromagnetic door holders are available in various sizes to suit different size doors and frequencies of use.

OPTIONS

Armature Bend

This armature option allows the armature to bend so that it has more flexibility in matching up with the device.

Armature Extension

The armature installed on the door has the option to be extended, depending on the distance between the door and the wall. If a door does not reach a wall due to an obstruction, the extension will help the armature reach the device installed on the wall.

Swivel Armature

This option adds a swivel to the armature so that it has more flexibility in matching up with the device.

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FIGURE 7.6 Electromagnetic Hold-Open Armature Extension
(Source: Courtesy of Scott J. Tobias)



FIGURE 7.7 Electromagnetic Hold-Open Swivel Armature Extension
(Source: Courtesy of Scott J. Tobias)

QUANTITIES

Electromagnetic door holders are furnished in single quantities and should be specified one for each door required.

APPLICATIONS

Floor

Electromagnetic door holders can be mounted on the floor with the ability to hold a single door or one leaf each of a back-to-back pair of doors in a bank. The armature or armatures are installed at the same location on the door.

Wall Surface

Electromagnetic door holders can be surface-mounted on the wall with the ability to hold a single door. The armature is installed at the same location on the door.

Wall Recessed

Electromagnetic door holders can be recessed in the wall with the ability to hold a single door. The armature is installed at the same location on the door.

INSTALLATION

Electromagnetic door holders can be installed on the wall or floor with the armature installed at the same location on the door. Alignment is very important for proper installation and operation of the device.

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FIGURE 7.8 Electromagnetic Hold-Open Not Aligned Properly
(Source: Courtesy of Scott J. Tobias)

Fasteners

Electromagnetic door holders are typically installed with screw fasteners, which are available for installation on wood, metal, or other materials such as drywall or concrete.

Locations

Electromagnetic door holders should be installed per the manufacturer's recommendations and where they are intended to hold open the door. An electromagnetic door holder is installed at the locking edge of the door either on the floor or on the wall. The armature is installed at the same location on the door.

Preparations

Electromagnetic door holder preparations take place in the field by the installer, including the drilling and tapping of screw holes.

FLOOR STOPS

DESCRIPTION

Floor stops can be used when a wall is not in the vicinity, but the designer must be wary of inadvertently creating a tripping hazard. The stop should be out of the way and typically up against a wall or area not used for walking.

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PROPERTIES

Finishes

Floor stops are typically available in a limited number of architectural finishes and should comply with the current version of ANSI/BHMA A156.18 American National Standard for Materials and Finishes.

Grades

Floor stops are categorized by grades as described in the standards of Tests for Door Stops in the current version of ANSI/BHMA A156.16 American National Standard for Auxiliary Hardware. These standards describe testing in cycles, aging, bumper retention, and impact.

Materials

Floor stops can be manufactured with an aluminum, brass, bronze, stainless steel, or steel housing that is mounted to the wall with a rubber insert that is impacted by the door or door hardware. Floor stops should comply with the Resilient Material Retention Test as described in the current version of ANSI/BHMA A156.16 American National Standard for Auxiliary Hardware.

TYPES

Floor stops come in various types, which can be manufactured from different materials, in various sizes, and using different mounting methods. The current version of ANSI/BHMA A156.16 American National Standard for Auxiliary Hardware describes floor stops as auxiliary hardware.

Automatic Hold-Open

An automatic hold-open device has a hold-open mechanism built into the device that mounts to the floor. When engaged with the holding device on the wall, the device automatically holds the door against the holding device until pushed or pulled, which releases the device.

Manual Hold-Open

A manual hold-open is a door stop with bumper that mounts to the floor with a hook eye built into it. The hold-open hook is installed on the door and has to be manually hooked to the holding device on the floor. The holding device holds the door until unhooked and released manually.



FIGURE 7.9 Manual Hold-Open Floor Stop
(Source: Courtesy of Rockwood® Manufacturing Company)

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Semi-Automatic Hold-Open

A semi-automatic hold-open is a device that mounts to the floor and has a hold-open mechanism built into it. When the holding device hook attached to the door is lowered manually, it can hold the door against open until manually released.

Stop

BUMPER

Some manufacturers have created their own uniquely designed floor stops, which are more decorative than standard floor stops. Others are manufactured as heavy duty, typically for exterior applications.

DOME

A dome stop is in the shape of a half of a dome with a metal housing and rubber bumper at the flat end in the middle of the stop. Dome stops are available in different heights and should be coordinated with the door undercut.

PENCIL

A pencil stop is a skinny post that is mounted to the floor and has a 90-degree angle with a rubber bumper at the end. The stem reaches out and hits the door before the door hits up against a wall or surrounding conditions.

STEM

A stem stop is a post, thicker than a pencil stop post that mounts to the floor and has a 90-degree angle with a rubber bumper at the end. The stem reaches out and hits the door before the door hits up against a wall or surrounding conditions.



FIGURE 7.10 Decorative Bumper Floor Stop

(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 7.11 Heavy-Duty Exterior Bumper Floor Stop

(Source: Courtesy of Scott J. Tobias)

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FIGURE 7.12 Floor Dome Stop
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 7.13 Floor Dome Stop
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 7.14 Floor Dome Stop
(Source: Courtesy of Rockwood® Manufacturing Company)

SIZES

Floor stops are available in various sizes to suit all size doors and frequencies of use.

OPTIONS

Risers

Dome stop risers are available, which are disc-like components that sit underneath a dome stop in order to lift it up higher off of the ground. Risers are typically used to accommodate larger door undercuts so that the back of the dome stop that stops the door does not slip underneath the undercut by being too short.

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QUANTITIES

Wall stops are furnished in single quantities and should be specified one for each door required.

APPLICATIONS

Surface Mounted

Depending on the type, floor stops are surface-mounted on the floor, face of the door, or both.

INSTALLATION

Depending on the type, floor stops are typically installed on the floor, face of the door, or both. Floor stops would be the second most preferred stopping method to a wall stop. Floor stops might contribute to a tripping hazard if not installed on the floor in the proper location or with the optimal application. Cleaning a wall stop is also easier than an overhead or floor stop, especially in sanitary environments such as a hospital.

Fasteners

Floor stops are typically installed with screw fasteners, which are available for installation on wood, metal, or other materials such as drywall or concrete.

Locations

Floor stops should be installed per the manufacturer's recommendations and where it is intended to stop the door. A floor stop would be installed at the locking edge of the door as close to the wall as possible to avoid a tripping hazard. The stop would be placed so that the paddle arm, push pull, exit device trim, lockset lever handle, or any other operating device would be protected by the door hitting the stop before any other operating hardware.

Preparations

Floor stop preparations take place in the field by the installer, including the drilling and tapping of screw holes.

WALL STOPS

DESCRIPTION

Wall stops should be the first choice, especially in healthcare facilities, as the bacteria and dirt are much easier to clean at a standing height surface than on the floor or overhead. They can be cleaned within arm's length—they can easily be sprayed with a cleaning agent and wiped clean without having to bend down or use a mop, which can create a buildup of dirt and bacteria over time.

PROPERTIES

Finishes

Wall stops are typically available in a limited number of architectural finishes and should comply with the current version of ANSI/BHMA A156.18 American National Standard for Materials and Finishes.

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Grades

Wall stops are categorized by grades as described in the standards of Tests for Door Stops in the current version of ANSI/BHMA A156.16 American National Standard for Auxiliary Hardware. These standards describe testing in cycles, aging, bumper retention, and impact.

Materials

Wall stops can be manufactured with an aluminum, brass, bronze, stainless steel, or steel housing that gets mounted to the wall with a rubber insert that is impacted by the door or door hardware. Wall stops should comply with the Resilient Material Retention Test as described in the current version of ANSI/BHMA A156.16 American National Standard for Auxiliary Hardware.

TYPES

Wall stops have various types, which can be manufactured from different materials, in various sizes, and using different mounting methods. The current version of ANSI/BHMA A156.16 American National Standard for Auxiliary Hardware describes wall stops as auxiliary hardware.

Automatic Hold-Open

An automatic hold-open device has a hold-open mechanism built into the device that protrudes off the face of the door. When engaged with the holding device on the wall, the hold-open mechanism automatically holds the door against the holding device until it is pushed or pulled, which releases the device.

Manual Hold-Open

A manual hold-open is a door stop with bumper that protrudes off of the face of the door with a hook eye built into it. The hold-open hook is installed on the wall and has to be manually hooked to the holding device on the wall. The holding device holds the door until unhooked and released manually.

Semi-Automatic Hold-Open

A semi-automatic hold-open is a device that protrudes off of the face of the door that has a hold-open mechanism built into it. When the holding device hook attached to the wall is lowered manually, it can hold the door open until it is manually released.

Stop

BUMPER

Concave

Concave wall bumpers can be manufactured with or without a metal housing and with or without visible screws. Regardless of the housing, there is a rubber bumper that is just a rim with a hollowed-out center. This configuration is typically specified when installing with a bored or cylindrical locket that has a pushbutton feature on the inside lever. Without a hollowed-out center, every time the lever with the pushbutton hits the stop, the pushbutton would depress and lock the lockset unintentionally.

Convex

Convex wall bumpers can be manufactured with or without a metal housing and with or without visible screws. Regardless of the housing, there is a solid rubber bumper. This configuration is typically

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FIGURE 7.15 Concave Wall Stop
(Source: Courtesy of Scott J. Tobias)



FIGURE 7.16 Convex Wall Stop
(Source: Courtesy of Scott J. Tobias)

specified when one is installing it with a bored or cylindrical locket that does not have a pushbutton feature on the inside lever. Without a pushbutton feature, there is no concern about the pushbutton being depressed and locking the lockset unintentionally.

FLEXIBLE STEM

Flexible stem stops are similar to stem stops where a skinny post protrudes off of the face of the door with a rubber bumper at the end, except the skinny post is a spring and can flex in various directions. The stem is long enough to clear any levers, pulls, or operating hardware that might be damaged or damage the surrounding elements.

HINGE PIN

Hinge pin stops, also known as adjustable pin stops, attach to hinge pins and have a bumper on both sides to limit the door swing and protect the door and wall or frame side from getting hit and causing damage.

PENCIL

A pencil stop is a skinny post that protrudes off of the face of the door with a rubber bumper at the end. The stem is long enough to clear any levers, pulls, or operating hardware that might get damaged or damage the surrounding elements.

STEM

A stem stop is a post, thicker than a pencil stop post that protrudes off of the face of the door with a rubber bumper at the end. The stem is long enough to clear any levers, pulls, or operating hardware that might get damaged or damage the surrounding elements.

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SIZES

Wall stops are available in various sizes to suit all size doors and frequencies of use.

OPTIONS

There are no options to wall stops other than the various options in design, finish, and installation.

QUANTITIES

Wall stops are furnished in single quantities and should be specified one for each door surface required.

APPLICATIONS

Surface Mounted

Depending on the type, wall stops are surface-mounted on the wall, face of the door, or both.

INSTALLATION

Wall stops typically are installed on the wall, face of the door, or both. They are the preferred stopping method because they do not pose a tripping hazard if installed on the floor instead. Cleaning a wall stop is also easier than doing so for an overhead or floor stop, especially in environments that must be kept sanitary such as a hospital.

Fasteners

Wall stops typically are installed with screw fasteners, which are available for installation on wood, metal, or other materials such as drywall or concrete.



FIGURE 7.17 No Wall Stop
(Source: Courtesy of Scott J. Tobias)



FIGURE 7.18 No Wall Stop
(Source: Courtesy of Scott J. Tobias)

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Locations

Wall stops should be installed at the height given in the manufacturer's recommendations and where they are intended to stop the door. A wall bumper would be installed at the centerline of the hospital arm, push pull, exit device trim, lockset lever handle, or any other operating device. A wall stem stop would be installed toward the bottom end of the door, sticking out far enough to reach the wall before any of the operating hardware to avoid damage to the door surface or surrounding elements.

Preparations

Wall stop preparations take place in the field by the installer, including the drilling and tapping of screw holes.

REFERENCES

Codes and standards are available to set the minimum requirements of door openings (see the Introduction of this book for more information). Some jurisdictions have specific codes and standards, which were either modified from another existing code or created for their own use.

Language and section numbers can change slightly or drastically when the codes are updated. Look for an outline, if available, of the changes that took place in the respective update.

CODES

International Building Code (IBC)

The following are chapters of a modified or fully adopted version of the International Building Code that refer to stops and holders or door hardware in general:

- Chapter 7: Fire and Smoke Protection Features
- Chapter 10: Means of Egress
- Chapter 17: Special Inspections and Tests

National Fire Protection Association (NFPA) 101: Life Safety Code

The following is a chapter of a modified or fully adopted version of the NFPA 101: Life Safety Code that refers to stops and holders or door hardware in general:

- Chapter 7

STANDARDS

ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)

The following is a chapter of a modified or fully adopted version of the ADA Accessibility Guidelines for Buildings and Facilities that refers to stops and holders or door hardware in general:

- Chapter 4: Accessible Routes

ASTM International (ASTM)

There are hundreds of ASTM International testing standards that are related to doors and door hardware, from material and assembly testing to installation and application testing.

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Door and Hardware Institute (DHI)

The following are technical documents available for reference that refer to stops and holders or door hardware in general:

- Abbreviations and Symbols
- Basic Architectural Hardware
- Hardware for Healthcare Facilities
- Installation Guide for Doors and Hardware
- Processing Hardware for Custom Aluminum Entrances
- Recommended Locations for Builders Hardware Custom Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Flush Wood Doors
- Recommended Procedures for Processing Hardware Schedules and Templates
- Sequence and Format for the Hardware Schedule
- Tech-Talk ASD-1 Aluminum Storefront Doors

International Code Council A117.1 Accessible and Usable Buildings and Facilities (ICC)

The following is a chapter of a modified or fully adopted version of the ICC A117.1 Accessible and Usable Buildings and Facilities that refers to stops and holders or door hardware in general:

- Chapter 4 Accessible Routes

National Fire Protection Association (NFPA)

The following are chapters of a modified or fully adopted version of NFPA 80: Standard for Fire Doors and Other Opening Protectives that refer to stops and holders or door hardware in general:

- Chapter 5: Care and Maintenance
- Chapter 6: Swinging Doors with Builders Hardware
- Chapter 7: Swinging Doors with Fire Door Hardware
- Chapter 8: Horizontally Sliding Doors
- Chapter 9: Special-Purpose Horizontally Sliding Accordion or Folding Doors
- Chapter 16: Access Doors
- Chapter 19: Installation, Testing, and Maintenance of Fire Dampers
- Annex A: Explanatory Material

The following is a chapter of a modified or fully adopted version of NFPA 105: Standard for Smoke Door Assemblies and Other Opening Protectives that refers to stops and holders or door hardware in general:

- Chapter 6: Installation, Testing, and Maintenance of Smoke Dampers

The following is a chapter of a modified or fully adopted version of NFPA 252: Standard Method of Fire Tests of Door Assemblies that refers to stops and holders or door hardware in general:

- Chapter 5: Fire Door Assembly
- Annex B: Commentary

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American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA)

The following are standards that refer to stops and holders or door hardware in general:

- ANSI/BHMA A156.6 American National Standard for Architectural Door Trim
- ANSI/BHMA A156.15 American National Standard for Release Devices Closer Holder, Electromagnetic and Electromechanical
- ANSI/BHMA A156.16 American National Standard for Auxiliary Hardware
- ANSI/BHMA A156.18 American National Standard for Materials and Finishes

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ACCESSORIES

Next in the sequence we list accessories that include astragals, thresholds, weatherstripping, and gasketing. We use these hardware types to seal the clearances around the perimeter of an opening. This can help with a number of issues including keeping sound, light, and smoke either in or out, maintaining energy efficiency, and helping to contain the inside weather and conditions inside the structure and the outside weather and conditions outside. Although most weatherstripping and gaskets are surface mounted or recessed installed, some door frame manufacturers offer their frames with gaskets already installed in kerfs where the rabbet meets the stop of the frame.

ASTRAGALS

Also Known As: Meeting Stile Seals, Gaskets, Weatherstripping

DESCRIPTION

An astragal is installed to cover or fill the clearance in between a pair of doors. Astragals are available in different configurations and are installed on the surface, recessed, or wrapped around the edge of a door in one piece or two. Astragals are recommended to be installed the entire height of a door and might be required by certain codes.

PROPERTIES

Finishes

Astragals are typically available in a limited number of architectural finishes and should comply with ANSI/BHMA A156.18 American National Standard for Materials and Finishes, 2012. Although some manufacturers might offer other options, the most typical astragal finishes available are anodized aluminum, bronze, dark bronze gold, and painted finishes. Astragals with gasket materials are typically available in brown, black, gray, tan, and white and can be manufactured from foam, neoprene, santoprene, silicone, brush, and other materials.

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Grades

Astragals are not categorized by grades and should comply with Test Requirements as described in ANSI/BHMA A156.21 American National Standard for Thresholds, 2009. These standards describe load and material.

Materials

Astragals can be manufactured with aluminum, brass, bronze, rubber, stainless steel, steel, wood, or other suitable material. Some thresholds have weatherstripping incorporated into the design, which can be a neoprene, brush, rubber, silicone, or santoprene (sustainable type) material.

TYPES

Astragals are available in various types, which can be manufactured from different materials, in a variety of sizes, using different mounting methods. ANSI/BHMA A156.22 American National Standard for Door Gasketing and Edge Seal Systems, 2005 describes the basic types.

Split

A split astragal is manufactured with two parts. One part is installed on each door leaf, which meets when the doors are in the closed position to create a seal for the center space between a pair of doors. The two parts can be of the same gasket material or one part a gasket with the other a metal or rubber material for the gasket to rest up against.

Overlapping

An overlapping astragal is installed on one door leaf of a pair of doors. The astragal overlaps and rests on the face of the second door leaf when the doors are in the closed position. This creates a seal for the center space between a pair of doors. Doors with overlapping astragals have to close in a certain order, one door before the other. If the door with the overlapping astragal closes first, the door without the astragal will not be able to pass the door with the astragal in order to get to a fully closed position, as the edge of the door will get caught on the edge of the astragal. A coordinator can be used to coordinate the proper closing sequence of a pair of doors to ensure proper closing and latching as necessary.

FLAT

A flat astragal is a flat plate that rests on the face of a door at the edge and hangs off the edge so that it can rest up against the other door when in the closed position.

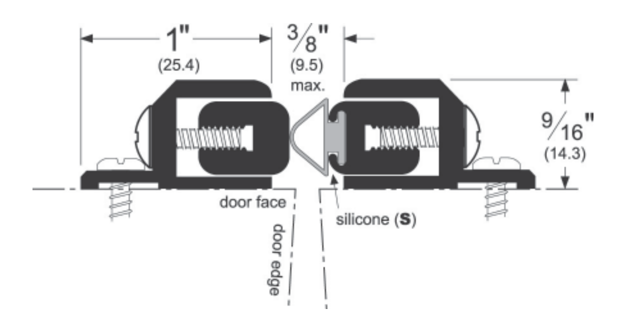


FIGURE 8.1 Adjustable Split Astragal
(Source: Courtesy of Pemko Manufacturing Company)

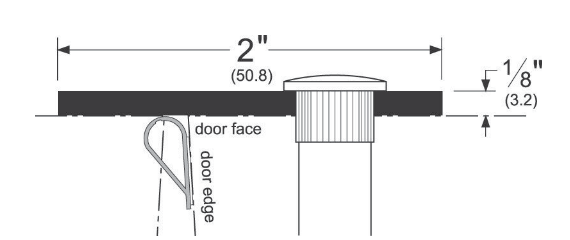


FIGURE 8.2 Overlapping Astragal
(Source: Courtesy of Pemko Manufacturing Company)

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TEE

Tee astragals are in the shape of a tee with the vertical portion installed against the edge of a door while the horizontal portion is installed on the face of the door edge.

Security

Security astragals are installed on the face of one leaf of a pair of doors while the other end rests on the face of the other leaf. There is an additional bracket, sometimes referred to as a cam, which is installed at the head to keep the astragal flush against the other door. The bracket is rigid and also assists the astragal with closing and resting against the door leaf properly.

SIZES

Astragals are available in various widths and are typically the same full height as the door. A flat astragal can be between 1 and 2 inches across, while a meeting stile astragal can be 1/2-inch wide overall. No matter the width, the edge portion always hangs off and meets with the other half or other door in the middle or resting on the face.

OPTIONS

Adjustable

Some astragals are available as adjustable where the gasket can be adjusted horizontally to accommodate for uneven gaps in between the two doors. This could be for a not-so-perfect installation or possibly for variations in pressurization or surrounding conditions that might prohibit the door from closing properly. The opposite side of the astragal where it meets the other door typically has screws along the height to make the slight adjustments as necessary. If the astragal is not adjustable and is installed incorrectly or unevenly, the entire astragal would have to be reinstalled in lieu of trying to adjust it first.

Cover

Snap cover versions are available to hide the surface-mounted screw fasteners of surface-mounted astragals. These astragals tend to be thicker and protrude off of the face of the door more than one without a cover due to the depth required to recess and cover the screw heads.

Cutout

Astragals might have the option to have cutouts made for any conflicting hardware such as a strike plate or faceplate of a deadlock or lockset.

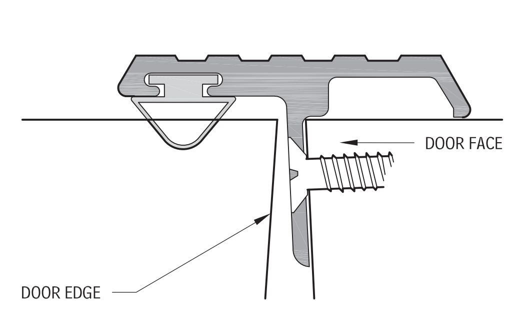


FIGURE 8.3 Overlapping Tee Astragal

(Source: Courtesy of Pemko Manufacturing Company)

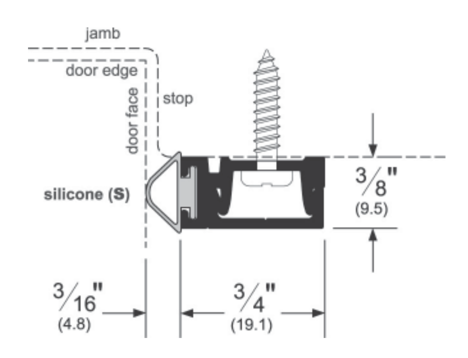


FIGURE 8.4 Snap Cover Astragal

(Source: Courtesy of Pemko Manufacturing Company)

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Fascia

Metal overlapping astragals are available with a wood fascia to cover the metal material with wood. This is typically an aesthetic decision and does not affect the operation of the astragal.

Locking

AUTOMATIC

Automatic locking astragals have spring bolts installed at the head of foot of the astragal. When installed, typically on the edge of an inactive leaf of a pair of doors, it acts as the flushbolt would in a pair of doors application. To retract the spring bolts, pull down or pull up on the trigger at the edge of the astragal and door; when released they automatically project.

MANUAL

Manual locking astragals have spring bolts installed at the head of foot of the astragal. When installed, typically on the edge of an inactive leaf of a pair of doors, the astragal acts as the flushbolt would in a pair of doors application. To project or retract the slide bolts, pull down or pull up on the slide mechanism at the edge of the astragal and door.

Seal

Overlapping astragals are available with or without different seal materials such as silicone, rubber, neoprene, santoprene, vinyl, and brush. If there is no gasket, the metal or material of the astragal rests directly on the surface of the door; if it has a gasket, it is in between the astragal and door and creates an additional seal along the entire height of the door.

Thermal Break

Also known as "broken," a thermal break surface is an astragal used to assist with the energy efficiency of the gap between a pair of doors. The astragal is manufactured with a three-piece surface, typically manufactured from metal on both sides and a separating material in the middle, which can be PVC, wood, rubber, or other suitable material to prohibit the temperature from traveling from one side of the astragal and doorway to the other.

QUANTITIES

Astragals are furnished in single quantities and should be specified one for each door required. This includes split astragal sets that might require multiple pieces to make the astragal whole.

APPLICATIONS

Recessed

Also known as meeting stile gaskets, astragals can be installed recessed into the edge of one or both doors of a pair, depending on the type.

Surface Mounted

Astragals can be surface-mounted on the face at the stile edge of one or both doors of a pair depending on the type.

INSTALLATION

Astragals are typically installed the full height vertically at the meeting stile center edges of a pair of doors.

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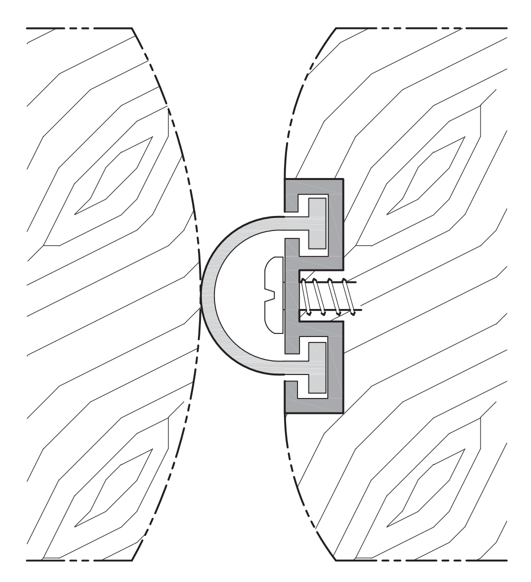


FIGURE 8.5 Recessed Meeting Stile Astragal
(Source: Courtesy of Pemko Manufacturing Company)

Fasteners

Astragals are typically installed with screw fasteners, which are available for installation on various door materials. Heavy-duty and security fasteners are available if required.

Locations

Astragals should be installed per the manufacturer's recommendations at the full height vertically at the meeting stile center edges of a pair of doors.

Preparations

Surface-mounted astragal preparations take place in the field by the installer, including the drilling and tapping of screw holes. Recessed astragal preparations take place at the factory, depending on the door material and what is available from the manufacturer.

THRESHOLD

Also Known As: Saddle

DESCRIPTION

A threshold is recommended to be installed to fit the entire jamb depth and width of a sill of a door opening. A threshold might be required for a number of reasons. Typically used between two different floor types, a threshold might be required for a transition between one side of a door with carpet and the other with tile. This would create a smooth transition where the two different floor types might create a more difficult one or tripping hazard.

Another reason for a threshold might be the adopted fire codes, some of which state that any combustible flooring, such as carpet, that goes underneath a doorway must have a threshold installed over it. This would help prevent the fire from spreading underneath the door from one room to another.

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PROPERTIES

Finishes

Thresholds are typically available in a limited number of architectural finishes and should comply with ANSI/BHMA A156.18 American National Standard for Materials and Finishes, 2012. Although some manufacturers might offer other options, the most typical threshold finishes available are aluminum, bronze, dark bronze, anodized aluminum, and stainless steel.

Grades

Thresholds are not categorized by grades and should comply with Test Requirements as described in ANSI/BHMA A156.21 American National Standard for Thresholds, 2009. These standards describe load and material.

Materials

Thresholds can be manufactured with aluminum, brass, bronze, rubber, stainless steel, steel, wood, or other suitable material. Some thresholds have weatherstripping incorporated into the design, which can be a neoprene, brush, rubber, silicone, or santoprene (sustainable type) material.

Surfaces

BROKEN

Also known as a thermal break, a broken surface is a threshold used to assist with the energy efficiency of the bottom of a door opening. The threshold is manufactured with a three-piece surface made up of metal on both sides and a separating material in the middle that can be PVC, wood, rubber, or other suitable material to prohibit the temperature from traveling from one side of the threshold and doorway to the other.

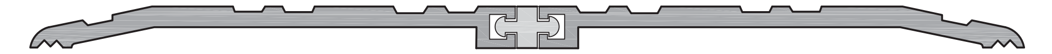


FIGURE 8.6 Thermally Broken Threshold
(Source: Courtesy of Pemko Manufacturing Company)

FLUTED

A fluted surface is a surface that has grooves horizontally across the threshold and along the entire width. The fluted surface can assist with traction or simply be an aesthetic preference.

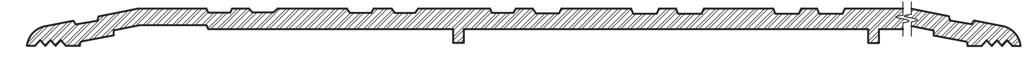


FIGURE 8.7 Fluted Threshold Profile
(Source: Courtesy of Pemko Manufacturing Company)

SMOOTH

A smooth surface is flat and smooth horizontally across the entire threshold and along the entire width. The smooth surface can be slippery if a substance is left behind from the weather or someone's shoe stepping on it.



FIGURE 8.8 Flat Surface Threshold
(Source: Courtesy of Pemko Manufacturing Company)

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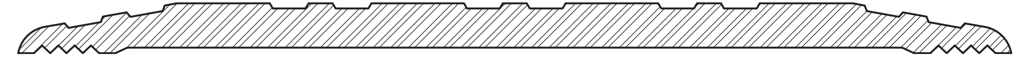


FIGURE 8.9 Heavy-Duty Flat Surface Threshold
(Source: Courtesy of Pemko Manufacturing Company)

TYPES

Thresholds are available in various types, which can be manufactured from different materials, in various sizes, using different mounting methods. ANSI/BHMA A156.21 American National Standard for Thresholds, 2009 describes the standards types of thresholds.

Adjustable

An adjustable threshold comes in parts, which are pieced together to make the whole threshold. Parts can include supporting ends, centerpieces, and thermal break material.

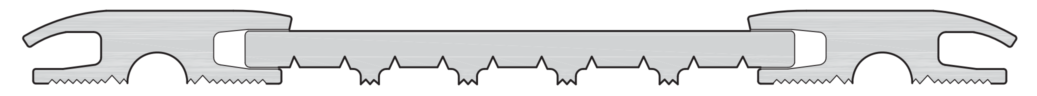


FIGURE 8.10 Adjustable Threshold
(Source: Courtesy of Pemko Manufacturing Company)

Bulkhead

Typically manufactured from a heavy plate material such as diamond plate, bulkhead thresholds, which might be installed on roof doors, are shaped like typical bulkheads with one step up from one side and two steps up on the other.

Compression

A compressing top saddle compresses slightly to help absorb the weight and pressure applied to it. Compressing top thresholds are not very common and therefore not often used.

Expansion Joint

ADJUSTABLE

An adjustable expansion joint threshold comes in parts, which are pieced together to make the whole threshold to cover building expansion joint gaps so that there is a continuous floor surface between the two.

COVER PLATES

Typically manufactured from aluminum material, cover plates are available to cover building expansion joint gaps so that there is a continuous floor surface between the two.

Half-Threshold

Half-saddles with a fluted surface are horizontal on one end and return back to the floor on the other end as a typical threshold would, and have a fluted top surface. The horizontal end either butts up against or rests on top of a floor type such as carpet, where the normal return to the floor would interfere with proper installation.



FIGURE 8.11 Half-Threshold
(Source: Courtesy of Pemko Manufacturing Company)

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Interlocking

Interlocking thresholds have a single or double lip at the top of the threshold to catch a hook strip that is applied to the door. The hook strip slides and locks into place under the lip of the threshold, giving the bottom of the opening a more secure and closed opening underneath the door. Some interlocking thresholds have a water return feature to drive the water away from the opening bottom rather than collecting and possibly making its way inside.

Latching Panic

Latching panic thresholds are rabbeted and have a stop surface for a door to stop against when in the closed position. The stop typically has a gasket material to help soften the closing of the door against the stop surface and to help create a better seal at the bottom of the door. In addition, although current codes and standards typically prohibit the use, the latching threshold is configured to work with a bottom latch of a surface-mounted vertical rod exit device. Latching panic thresholds are available with barrier-free and fluted top surface options.

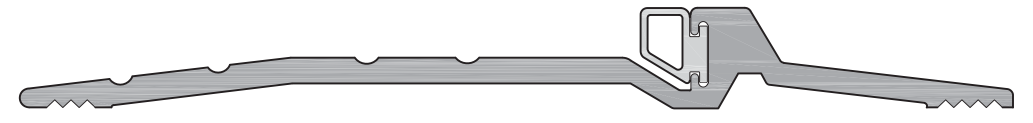


FIGURE 8.12 Latching Threshold
(Source: Courtesy of Pemko Manufacturing Company)

Plate, Fluted Surface

Plate thresholds with a fluted surface are flat plates that remain horizontal on both ends and have a fluted top surface. Flat plates can be surface-mounted on the floor or recessed in the floor to have a continuous flush installation.

Rabbeted

Rabbeted thresholds have a stop surface for a door to stop against when in the closed position. The stop typically has a gasket material to help soften the closing of the door against the stop surface and to help create a better seal at the bottom of the door.

Ramped, Barrier Free

Ramped thresholds are available with a fluted top surface and are barrier free. Ramped thresholds typically are used on offset floors that have a slight step to them to make them accessible. An accessible compliant ramped threshold can accommodate floors with from 1/2-inch to over 2-inch surface changes.

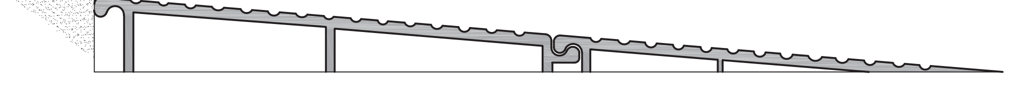


FIGURE 8.13 Modular Ramp
(Source: Courtesy of Pemko Manufacturing Company)

Residential

Thresholds are available for specific residential door openings, which have different code and standard requirements and are different configurations than commercial construction door openings. Some residential door manufacturers manufacture complete door openings, including the door, frame, hardware, gasketing, and threshold.

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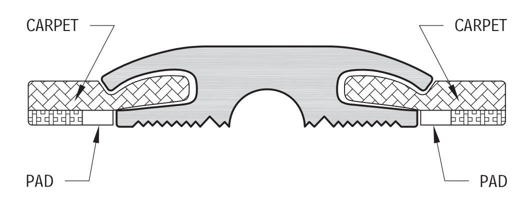


FIGURE 8.14 Residential Vinyl Threshold
(Source: Courtesy of Pemko Manufacturing Company)

Saddle

A saddle is a traditional threshold that returns to the floor on both ends and is installed in between the entire jamb width opening of a door frame or opening. Saddles can be manufactured with smooth or fluted surfaces, be barrier free, and can eliminate offset floor steps or transitions.

Saddle for Floor Closers

Some manufacturers offer thresholds to cover the floor closer in lieu of the standard decorative cover plate and or cover plate for terrazzo or other floor covering. Thresholds might be required by some codes for floor-type transitions and when using a floor closer in those opening types, optimally furnishing the threshold by the same manufacturer as the floor closer would be the best option. Floor closer thresholds are available for center or offset hung closers, with or without mitered ends, and with smooth or fluted top surfaces.

SIZES

Thresholds are available in various widths and heights. A flat plate or low raised plate can measure ¼ inch in thickness or overall height while the maximum allowed threshold height per accessibility codes and standards is ½ inch. Ramped thresholds must comply with a 1:12 slope, which means the slope of the ramp can change 1 inch in height for every 12 inches of distance.

OPTIONS

Epoxy-Filled Surfaces

Fluted surfaces have the option to be filled with various materials to help with traction such as an epoxy material, or with visibility such as with a photoluminescent epoxy material. These materials fill the fluted top surface voids and harden to become part of the threshold.

Anchors

Anchors are available to assist the fasteners with attaching to certain materials such as concrete or other floor surfaces or materials. The anchor is typically installed deeper into the floor than a standard screw fastener and will withstand higher abuse and frequency of use.

Barrier Free

A barrier-free option ensures that the threshold complies with accessibility codes, standards, and requirements, which allow certain maximum threshold and floor transition heights.

Coating

Thresholds are available with optional coatings that assist with making the surface slip resistant. This surface option might be desired in an area that experiences a lot of rainfall or snow.

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Cutouts

Thresholds might need to have cutouts for hardware such as dust-proof strikes or concealed vertical rod exit device latches.

Systems

Thresholds, most commonly ramped thresholds, are available in systems, which are preconfigured components made into their own solution to accommodate common field conditions and applications.

Sound Transmission Class (STC)

Sound transmission class (STC) ratings measure the sound through a partition such as a wall, ceiling, and doors. (Some refer to the "C" as co-efficiency, but the correct term is "class.") A standard rating, such as speech through a wall, would be STC 25, while STC 30–35, a slightly higher rating, would muffle the speech, although it still would be able to be heard. At STC 50, a band might be heard through a wall, but most sounds are contained and not heard at a rating this high. Higher ratings are available by specialty door manufacturers who specialize in heavy-duty sound attenuation.

QUANTITIES

Thresholds are furnished in single quantities and are specified one for each door required. This includes adjustable or ramped component thresholds that might require multiple pieces to make the threshold whole.

APPLICATIONS

Recessed

A flat plate threshold can be installed recessed in a floor so that it is flush with the floor creating a continuous surface.

Surface Mounted

Thresholds are typically installed surface-mounted on the floor or floor surface material.

INSTALLATION

It is typically recommended that a threshold be installed horizontally across the entire door width and across the entire jamb width opening. For example, if installing a threshold into a hollow metal frame with a 5 3/4-inch jamb width opening, a 4-inch-wide threshold would be inappropriate. Instead, a product at least 6 inches wide would be installed.

Fasteners

Thresholds are typically installed with screw fasteners, which are available for installation on various floor materials. If a heavy-duty or special application is required, other types of bolts and anchor options are available to be specified and used for the installation.

Locations

Thresholds should typically be installed per the manufacturer's recommendations and horizontally between a door frame or door opening. They should cover the entire jamb width opening of the frame or framed opening.

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Preparations

Threshold preparations take place in the field by the installer, including the drilling and tapping of screw holes, and any anchor or special fastener installation preparations.

WEATHERSTRIPPING AND GASKETING

Also Known As: Weatherstrip, Gasket, Seals, Sound/Weather/Light Seals, Sound/Weather/Light Gaskets

DESCRIPTION

Weatherstripping and gasketing are installed to cover or fill the clearance surrounding a door or doors in a frame. Weatherstripping and gasketing are available in different configurations and are installed, either surface-mounted or recessed, around the perimeter edge of a door. Weatherstripping and gasketing are recommended to be installed the entire height and width of a door and might be required by certain codes or standards.

PROPERTIES

Finishes

Weatherstripping and gasketing are typically available in a limited number of architectural finishes and should comply with ANSI/BHMA A156.18 American National Standard for Materials and Finishes, 2012. Although some manufacturers might offer other options, the most typical astragal finishes available are anodized aluminum, bronze, dark bronze, gold, and painted finishes. Astragals with gasket materials are typically available in brown, black, gray, tan, and white and can be manufactured from foam, neoprene, santoprene, silicone, brush, and other materials.

Grades

Weatherstripping is not categorized by grades and should comply with Test Requirements as described in ANSI/BHMA A156.22 American National Standard for Door Gasketing and Edge Systems, 2005.

Materials

Weatherstripping housing can be manufactured with aluminum, brass, bronze, rubber, stainless steel, steel, wood, or other suitable material. The weatherstripping material inserted into the housings can be manufactured of neoprene, brush, rubber, silicone, or santoprene (sustainable type) material.

Some codes and standards require the use of intumescent materials, which expand when heated to a certain degree to seal and close any gaps surrounding an opening. Intumescent materials can be installed two ways, either on the frame or as part of the construction of a wood door edge, hidden behind the finished wood veneer.

TYPES

Weatherstripping and gasketing are available in various types, which can be manufactured from different materials, in various sizes, using different mounting methods. ANSI/BHMA A156.22 American National Standard for Door Gasketing and Edge Seal Systems, 2005 describes the basic types.

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Head and Jamb

Head and jamb weatherstipping is attached to the head and both jambs of the door frame. There are several types of basic head and jamb gaskets, which are described below.

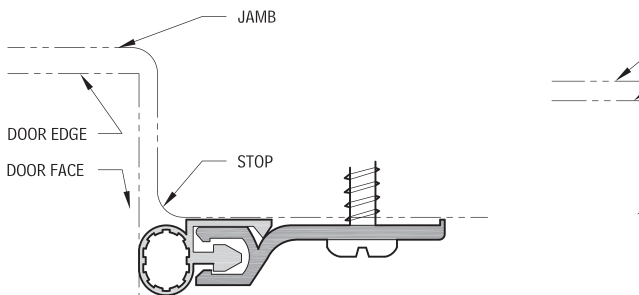


FIGURE 8.15 Surface-Mounted Perimeter Seal in Housing

(Source: Courtesy of Pemko Manufacturing Company)

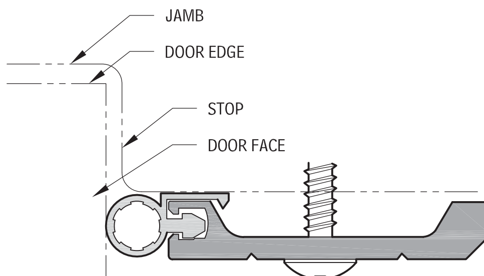


FIGURE 8.16 Heavy-Duty Surface-Mounted Perimeter Seal Housing

(Source: Courtesy of Pemko Manufacturing Company)

ENCASED IN RETAINER

This type of weatherstripping is a simple housing with a gasket material attached to it.

ADJUSTABLE

Adjustable weatherstripping is an encased weatherstripping that has a larger housing that can be adjusted to fill uneven clearances surrounding the door opening. The adjustments are typically accomplished with built-in screws.

SELF-ADHESIVE

Although very easy to install and convenient, self-adhesive weatherstripping has the tendency to peel off of the door frame. Although tested and reliable when installed correctly, if the surface is not clean prior to installing or if the instructions are not followed exactly, it will not last very long.

SPRING

Spring weatherstripping is available to give the door tension in the opening. This will assist in keeping the door from rattling in a frame, although it is not a very commonly used type of weatherstripping.

MAGNETIC

Magnetic weatherstripping is available to give the gaskets a better chance of sealing the perimeter by matching up with another half that seals the gap magnetically.

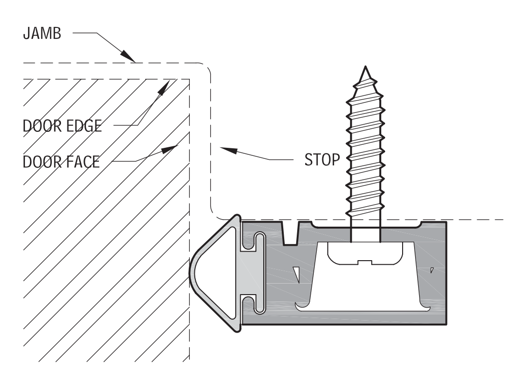


FIGURE 8.17 Surface-Mounted Perimeter Seal in Housing with Cover

(Source: Courtesy of Pemko Manufacturing Company)

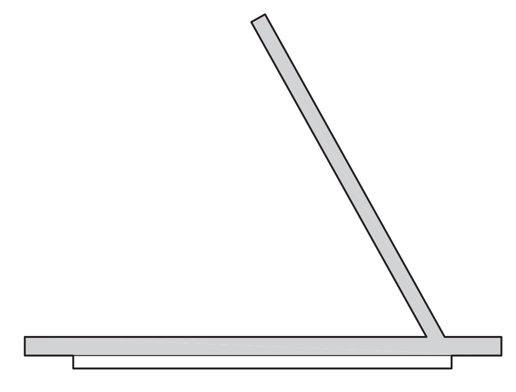


FIGURE 8.18 Surface-Mounted Single Fin Adhesive Perimeter Seal

(Source: Courtesy of Pemko Manufacturing Company)

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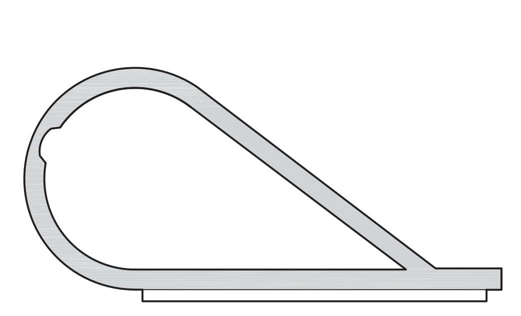


FIGURE 8.19 Surface-Mounted Bulb Adhesive Perimeter Seal
(Source: Courtesy of Pemko Manufacturing Company)

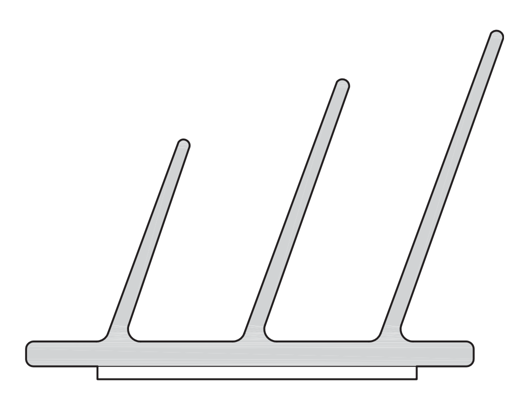


FIGURE 8.20 Surface-Mounted Triple Fin Adhesive Perimeter Seal
(Source: Courtesy of Pemko Manufacturing Company)

INTERLOCKING

Interlocking weatherstripping is manufactured with two pieces and does like its name describes, interlocks with each other to create a tight seal.

Door Sweep

ENCASED IN RETAINER

Similar to the simple encased in retainer weatherstripping, the gasket material is attached to the housing, which is surface-mounted onto the door. This type of bottom "sweeps" the floor, as it does not have any rising or dropping motion as with an automatic door bottom.

DOOR SHOE

A door shoe is a housing that wraps around the bottom of the door with a weatherstripping material that is affixed to it and sweeps the floor similary to a surface-mounted door sweep.

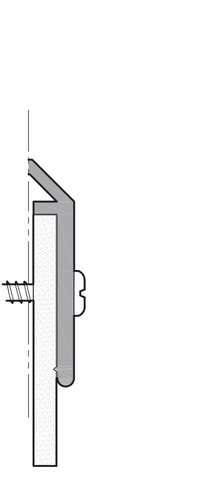


FIGURE 8.21 Surface-Mounted Door Sweep in Housing
(Source: Courtesy of Pemko Manufacturing Company)

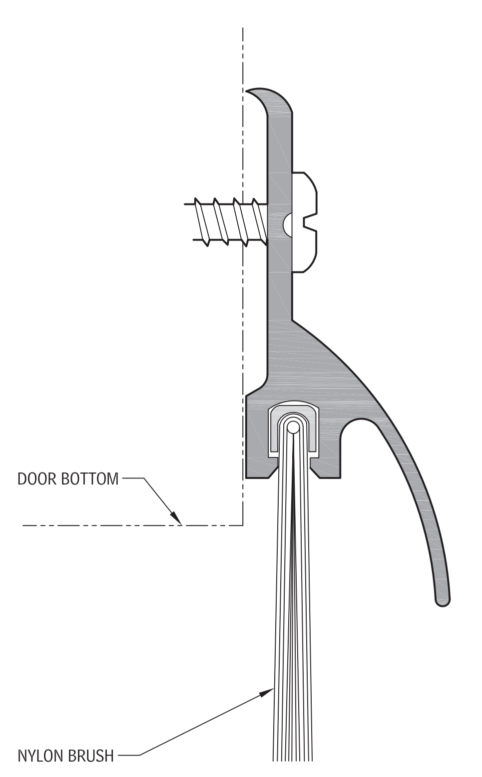


FIGURE 8.22 Surface-Mounted Door Sweep Brush in Housing
(Source: Courtesy of Pemko Manufacturing Company)

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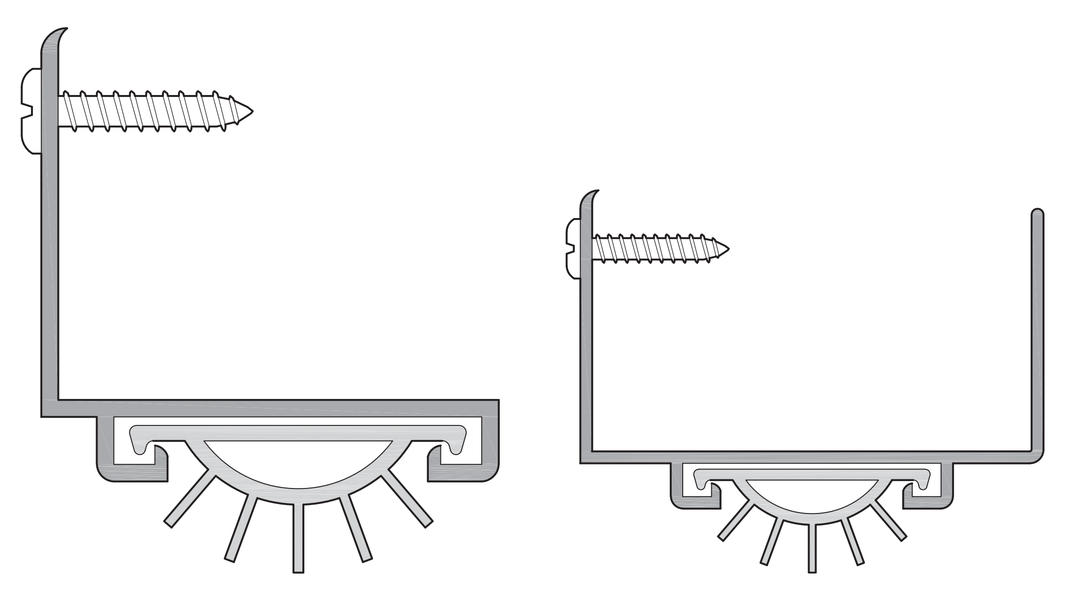


FIGURE 8.23 Surface-Mounted Half-Door Shoe
(Source: Courtesy of Pemko Manufacturing Company)

FIGURE 8.24 Surface-Mounted Full Door Shoe
(Source: Courtesy of Pemko Manufacturing Company)

DOOR SHOE WITH DRIP CAP

A door shoe with a drip cap is similar to a door shoe that has a housing that wraps around the bottom of the door with a weatherstripping material that is affixed to it and sweeps the floor similar to a surface-mounted door sweep. In addition, there is a curved material that helps with keeping water and other substances away from the clearance at the bottom of the door so it does not to get inside the structure.

AUTOMATIC ENCASED IN RETAINER/SURFACE

A surface-mounted automatic door bottom is surface-mounted on the push side face of the door when it is hung in a door frame, and drops down to seal the bottom clearance when the door is in the closed position and rises up when in the open position. There is a small trigger that when depressed, causes the bottom to drop down; this is why it is important that the automatic door bottom is installed on the push side face of the door, so that the trigger is depressed on the frame soffit when the door closes.

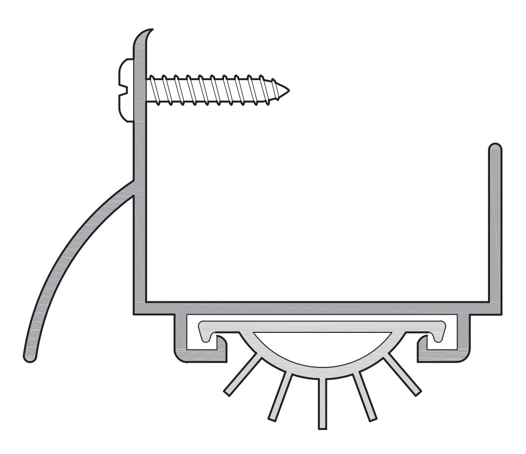


FIGURE 8.25 Door Shoe with Drip Cap
(Source: Courtesy of Pemko Manufacturing Company)

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AUTOMATIC ENCASED IN RETAINER/MORTISED OR CONCEALED

A concealed mounted automatic door bottom is mortised underneath the door in the center of the overall door thickness and used when the door is hung in a door frame. The seal drops down to seal the

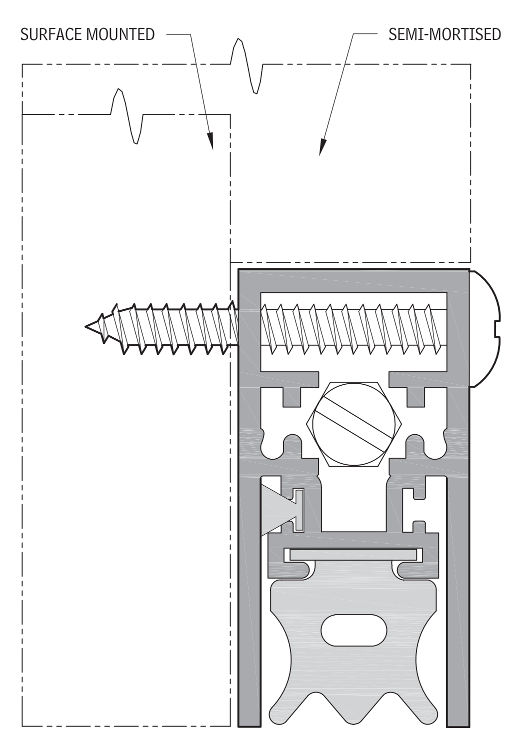


FIGURE 8.26 Surface-Mounted Automatic Door Bottom
(Source: Courtesy of Pemko Manufacturing Company)

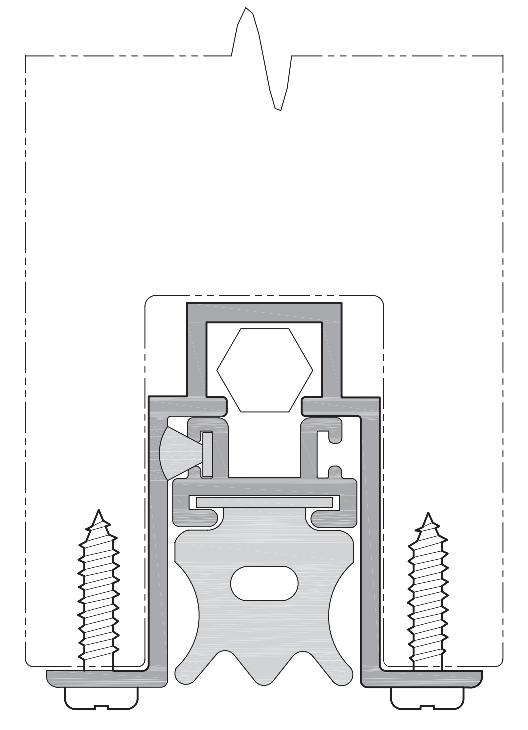


FIGURE 8.27 Concealed or Mortised Automatic Door Bottom
(Source: Courtesy of Pemko Manufacturing Company)

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bottom clearance when the door is in the closed position and rises up when in the open position. There is a small trigger that when depressed causes the bottom to drop down; this is why it is important that the automatic door bottom is installed in a door frame, so that the trigger is depressed on the frame soffit when the door closes.

Be aware of concealed hardware conflicts such as flushbolts and vertical rod exit devices, and be aware of fire rated wood doors, where automatic door bottoms might not be tested to meet applicable fire door codes.

SIZES

Door bottoms are available in various widths to accommodate different size door widths. Depending on the type, some might have more flexibility with being modified and shortened in the field.

OPTIONS

Adjustable

Automatic door bottoms are available with adjusting screws to slightly raise and lower the actuating portion of the device. This allows for proper placement of the gasket against the floor or threshold, instead of having the gap visible or rubbing too hard against the bottom surface.

Cover

Although automatic door bottoms have a covering on the device mechanism, they are typically not removable covers as with weatherstripping, but rather a completely shaped housing. As such, the screws are typically visible on surface mounted devices as they are applied through the face of the device, but concealed devices are typically affixed from the bottom/underneath the door, which conceals the fasteners.



FIGURE 8.28 Meeting Stile Brush Weatherstripping
(Source: (Courtesy of Scott J. Tobias)

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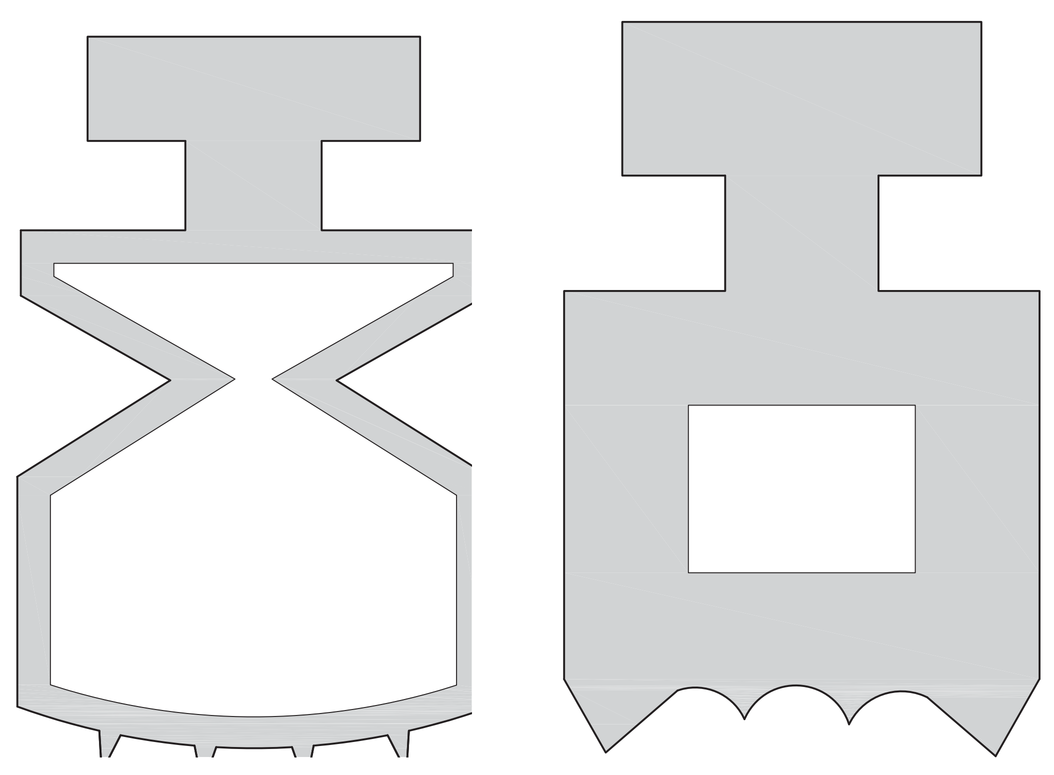


FIGURE 8.29 Alternate Insert Materials and Shapes
(Source: Courtesy of Pemko Manufacturing Company)

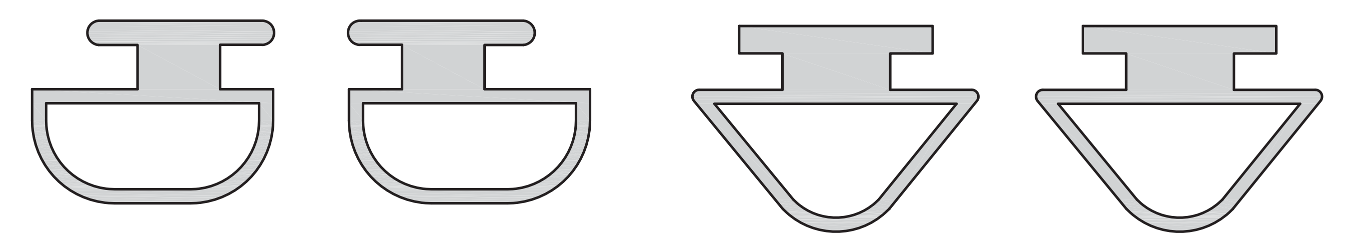


FIGURE 8.30 Alternate Insert Materials and Shapes
(Source: Courtesy of Pemko Manufacturing Company)

Inserts

The door bottom weatherstripping insert material can be foam, neoprene, santoprene, silicone, brush, and other materials, and can also vary in shape.

Weatherstripping is furnished in quantities to suit the head and both jambs of a door opening and should be specified for each door width and height as required.

APPLICATIONS

Recessed

Some door frame manufacturers install recessed weatherstripping in a kerf integral in the frame at the corner of the rabbet where the stop meets the soffit. Some have a material built into the design to act

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as a break to keep the metal from touching metal. This is ideal for energy efficiency—if the frame is hot on the outside and cold on the inside, the temperatures are not touching and do not affect each other as greatly as if there were no break.

Surface Mounted

Weatherstripping is typically surface-mounted with the housing on the face at the frame soffit to allow the actual gasket material to be compressed against the door.

INSTALLATION

Weatherstripping is typically installed the full height vertically of both frame jambs and horizontally across the head of the frame.

Fasteners

Weatherstripping is typically installed with screw fasteners, which are available for installation on various door materials. Heavy-duty and security fasteners are available if required.

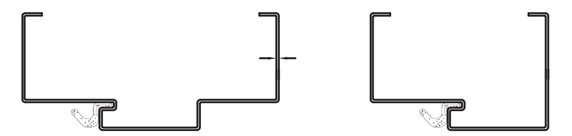


FIGURE 8.31a Kerf Hollow Metal Door Frame
(Source: Courtesy of Ceco Door)



FIGURE 8.31b Kerf Hollow Metal Door Frame
(Source: Courtesy of Dave Goetzinger)

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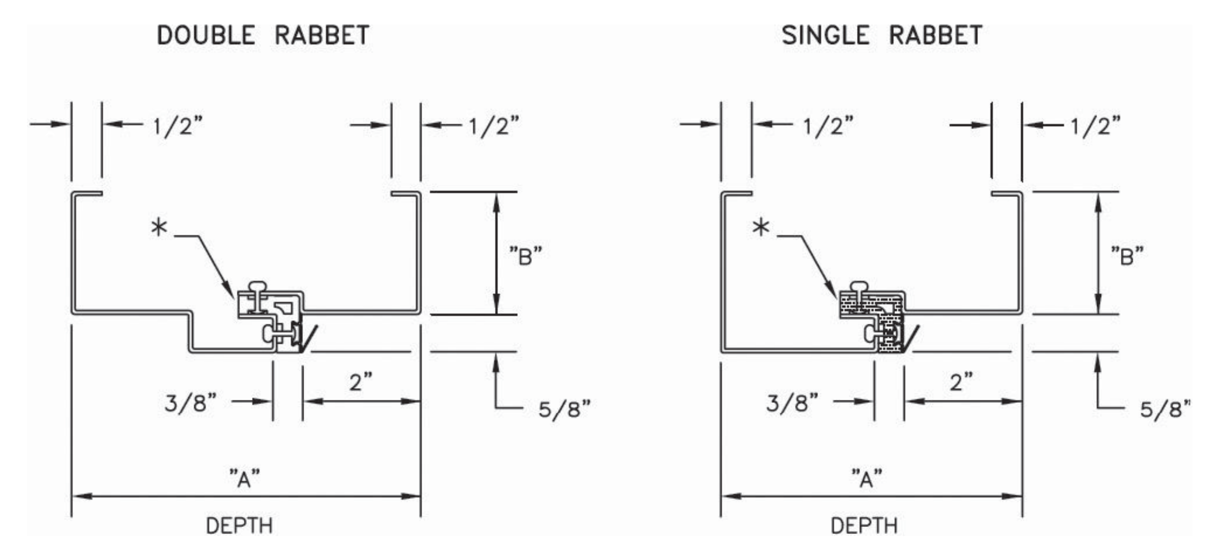


FIGURE 8.32 Thermal Break Hollow Metal Frame
(Source: Courtesy of Ceco Door)

Locations

Weatherstripping should be installed per the manufacturer's recommendations and the full height vertically of both frame jambs and horizontally across the head of the frame.

Preparations

Surface-mounted weatherstripping preparations take place in the field by the installer, including the drilling and tapping of screw holes. Recessed preparations take place at the factory, depending on the door material and the services available from the manufacturer.

REFERENCES

Codes and standards are available to set the minimum requirements of door openings (see the Introduction of this book for more information). Some jurisdictions have specific codes and standards, which were either modified from another existing code or were created for their own use.

Language and section numbers can change slightly or drastically when the codes are updated. Look for an outline, if available, of the changes that took place in the respective update.

CODES

International Building Code (IBC)

The following are sections of a modified or fully adopted version of the International Building Code, which refer to astragals, door gasketing and edge seal systems, or door hardware in general:

- Chapter 7: Fire and Smoke Protection Features
- Chapter 10: Means of Egress

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National Fire Protection Association (NFPA) 101: Life Safety Code

The following is a chapter of a modified or fully adopted version of the NFPA 101: Life Safety Code, which refers to astragals, door gasketing and edge seal systems, or door hardware in general:

- Chapter 7: Means of Egress

STANDARDS

ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)

The following is a chapter of a modified or fully adopted version of the ADA Accessibility Guidelines for Buildings and Facilities, which refers to astragals, door gasketing and edge seal systems, or door hardware in general: Chapter 4: Accessible Routes

American National Standards Institute (ANSI) S12.60 Acoustical Performance Criteria, Design Requirements and Guidelines for Schools

This standard identifies requirements for sound in various types of schools and school settings, and is required by LEED v2009 for Schools.

ASTM International (ASTM)

There are hundreds of ASTM International testing standards that are related to doors and door hardware, from material and assembly testing to installation and application testing.

ASTM E90—Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

ASTM E413—Classification for Rating Sound Insulation

ASTM E1332—Standard Classification for Rating Outdoor-Indoor Sound Attenuation

ASTM E2235—Standard Test Method for Determination of Decay Rates for Use in Sound Insulation Test Methods

Door and Hardware Institute (DHI)

The following are technical documents available for reference that refer to astragals, door gasketing and edge seal systems, or door hardware in general:

- Abbreviations and Symbols
- Basic Architectural Hardware
- Hardware for Healthcare Facilities
- Installation Guide for Doors and Hardware
- Processing Hardware for Custom Aluminum Entrances
- Recommended Locations for Builders Hardware Custom Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Flush Wood Doors
- Recommended Procedures for Processing Hardware Schedules and Templates
- Sequence and Format for the Hardware Schedule
- Tech Talk WS-1/Rev Gasketing and Thresholds

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Leadership in Energy and Environmental Design (LEED)

The USGBC created the LEED rating system, which is a volunteer rating system for construction buildings. LEED stands for Leadership in Energy and Environmental Design and has been the platform for mandatory adoption and code creation. This standard addresses sustainability, energy efficiency, human health, and saving the earth's resources for future generations.

National Fire Protection Association (NFPA)

Following are chapters of a modified or fully adopted version of NFPA 80: Standard for Fire Doors and Other Opening Protectives, which refer to astragals, door gasketing and edge seal systems, or door hardware in general:

- Chapter 5: Care and Maintenance
- Chapter 6: Swinging Doors with Builders Hardware
- Chapter 7: Swinging Doors with Fire Door Hardware
- Chapter 8: Horizontally Sliding Doors
- Chapter 9: Special-Purpose Horizontally Sliding Accordion or Folding Doors
- Chapter 16: Access Doors
- Chapter 19: Installation, Testing, and Maintenance of Fire Dampers
- Annex A: Explanatory Material

The Following is a chapter of a modified or fully adopted version of NFPA 105: Standard for Smoke Door Assemblies and Other Opening Protectives, which refers to astragals, door gasketing and edge seal systems, or door hardware in general:

- Chapter 6: Installation, Testing, and Maintenance of Smoke Dampers

The following is a chapter of a modified or fully adopted version of NFPA 252: Standard Method of Fire Tests of Door Assemblies, which refers to astragals, door gasketing and edge seal systems, or door hardware in general:

- Chapter 5: Fire Door Assembly
- Annex B: Commentary

American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA)

The following are standards that refer to astragals, door gasketing and edge seal systems, or door hardware in general:

- ANSI/BHMA A156.22 American National Standard for Door Gasketing and Edge Seal Systems
- ANSI/BHMA A156.18 American National Standard for Materials and Finishes

Underwriters Laboratory (UL)

UL is an independent safety company innovating solutions for many of the items that we use every day, from electricity to sustainability and renewable energy. UL is dedicated to testing for safe environments to help safeguard people and there are many UL standards that affect doors and door hardware.

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The following are sections of a modified or fully adopted version of UL that refer to astragals, door gasketing and edge seal systems, or door hardware in general:

- UL 10B, Fire Tests of Door Assemblies
- UL 10C, Positive Pressure Fire Tests of Door Assemblies
- UL1784, Air Leakage Test of Door Assemblies

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Miscellaneous Items

BUMPER GUARD

Also Known As: Door Guard

DESCRIPTION

Bumper guards are available to protect the surface of a door from being struck by heavy carts, machinery, or any other object that might move through the opening. Rather than having objects hit the face of the door or installed hardware directly, these guards protect the door and hardware surfaces from being struck and damaged. There are various configurations manufactured to protect various types of door hardware devices that might be on the face of a door.

PROPERTIES

Bumper guards are typically manufactured from steel and are either a single or component piece assembly that protrudes off of the face of a door in order to be struck before anything else is hit or damaged such as a lockset or exit device.

Finishes

These devices are typically manufactured from stainless steel material, which is very durable, requires no maintenance, and is the most weather resistant finish. There are some available in brass or bronze base metals, which allow for the matching of the architectural finishes of the balance of the door hardware such as the lockset or hinges.

Grades

Bumper guards are not typically categorized in grades.

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Materials

Bumper guards are typically manufactured from stainless steel, although some are available with brass or bronze base metals with an architectural finish.

TYPES

EXIT DEVICE

Configurations are available to surround or straddle the exit device touchpad-type device. There are also configurations available to cover the back end of the device, closest to the hanging side of the opening.

LOCKSET

There are configurations available to be installed near and to protrude farther than a lockset lever handle of a lockset with various angle returns back to the door surface. There are some devices that extend across the entire width of a door opening without an angled return.



FIGURE 9.2 Exit Device Bumper Guard
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.1 Exit Device Bumper Guard
(Source: Courtesy of Scott J. Tobias)

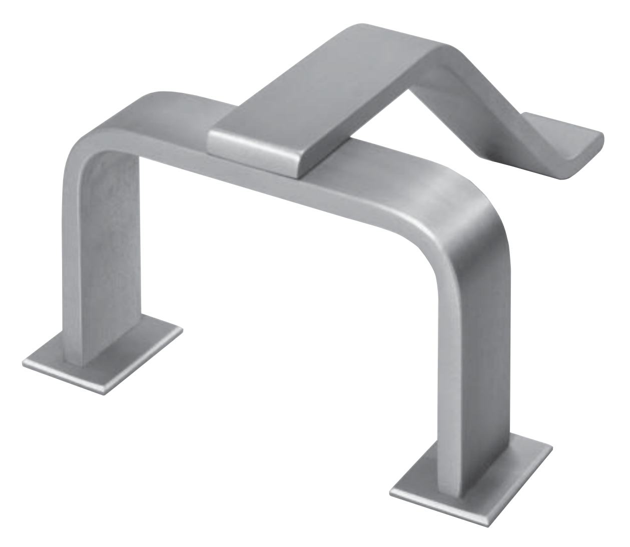


FIGURE 9.3 Exit Device Bumper End Guard
(Source: Courtesy of Rockwood® Manufacturing Company)

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FIGURE 9.4 Lockset Bumper Guard
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.5 Lockset Bumper Guard
(Source: Courtesy of Rockwood® Manufacturing Company)

OPTIONS

Other than the various configurations that are available to protect various door types, some of which are shown in the Types section above, options might be the base metals, finish, and fasteners used to secure the device to the door.

QUANTITIES

Depending on the application, typically one device is used per door leaf when a lockset is installed. An exit device typically requires one set, which can be composed of two or three parts installed on the door to protect the end of the device when the door is in the open position.

APPLICATIONS

These devices are all surface-mounted on the face of the door to protect the installed hardware and the surface of the face of the door.

INSTALLATION

Fasteners

Bumper guards are typically installed with screw fasteners, which are available for installation on wood or metal door materials. A bumper guard has surface-mounted countersunk screws but can be installed with through-bolts if a more heavy-duty installation are required.

Locations

Bumper guards should be installed as recommended by the product manufacturer but are typically installed near or surrounding the operating hardware of the door such as a lockset or exit device.

CARD HOLDERS

Also Known As: Card Slot

DESCRIPTION

Card holders are used to hold an index card. In the past, they might have been used on the face of a card catalog in a library to indicate what references are inside the particular drawer, for example, alphabetical designations of A–AM on one drawer face and AN–AZ on the next drawer face.

These card holders might have also been used on the outside of a classroom door holding an index card with the class name, number, or room number.

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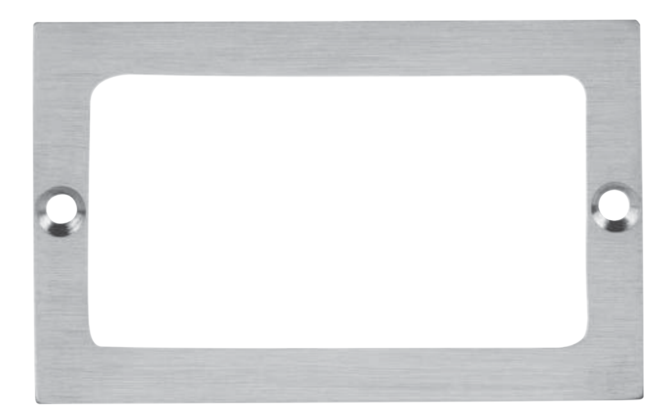


FIGURE 9.6 Card Holder
(Source: Courtesy of Rockwood® Manufacturing Company)

PROPERTIES

Finishes

Depending on the manufacturer, card holders are available in most architectural finishes to match other installed hardware on the door such as the hinges and lockset.

Grades

Card holders are not typically categorized in grades.

Materials

Card holders are most typically manufactured from brass, but can also be manufactured from other materials such as bronze, steel, or stainless steel.

TYPES

There is generally only one type of card holder, a rectangular frame that is installed on the face of a door, wall, or drawer, and holds a card of the same or smaller size.

OPTIONS

There are typically no options for card holders other than the size, material, finish, and fasteners.

QUANTITIES

Card holders are typically installed one per door or drawer leaf.

APPLICATIONS

Card holders are typically applied to the face of a door, wall next to a door, or drawer face.

INSTALLATION

Fasteners

Card holders are typically installed with screw fasteners provided by the manufacturer but could also likely be adhered if the proper materials are used.

Locations

Card holders do not have a set location but are typically installed at the average sight height.

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COAT HOOKS

Also Known As: Door Hook, Robe Hook, Clothes Hook, Towel Hook

DESCRIPTION

Coat hooks are typically mounted on the backside or room side of a door where you might hang a coat. They might be specified on the back of private or hotel bathroom doors to hold towels or a bathrobe.



FIGURE 9.7 Coat Hook
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.8 Coat Hook
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.9 Coat Hook
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.10 Coat Hook
(Source: Courtesy of Rockwood® Manufacturing Company)

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FIGURE 9.11 Coat Hooks
(Source: Courtesy of Scott J. Tobias)



FIGURE 9.12 Coat Hooks
(Source: Courtesy of Scott J. Tobias)



FIGURE 9.13 Coat Hook
(Source: Courtesy of Scott J. Tobias)

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PROPERTIES

Finishes

Depending on the manufacturer, coat hooks are available in most architectural finishes to match other installed hardware on the door such as the hinges and lockset.

Grades

Coat hooks are not typically categorized in grades.

Materials

Coat hooks are most typically manufactured from brass, but can also be manufactured from other materials such as bronze, steel, or stainless steel. Coat hooks might also have additional materials incorporated into the design such as wood, leather, or rubber.

TYPES

There are various types of coat hooks typically distinguished by various shapes and sizes, but all with the same intent: typically to hold your coat, towel, or other article of clothing on the back of a door. Some coat hooks have more than one hook to hold multiple items.

OPTIONS

There are typically no options for coat hooks other than the size, material, finish, and fasteners.

QUANTITIES

Coat hooks are typically installed one per door leaf but might have multiple hooks on one device.

APPLICATIONS

Coat hooks are typically applied to the back face of a door or on the wall next to a door.

INSTALLATION

Fasteners

Coat hooks are typically installed with screw fasteners provided by the manufacturer but could also likely be adhered if the proper materials are used. There are also some coat hooks that are magnetic, but might have a hard time holding up heavier objects.

Locations

Coat hooks do not have a set location but are typically installed at the average sight height.

DECALS

Also Known As: Stickers

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DESCRIPTION

Decals are used to identify certain common phrases required by certain codes, which might have a saying such as, "This Door to Remain Unlocked When Occupied." In addition to these examples, various manufacturers have various decals available that might not be required by some codes, including letter and number decals that can be used to customize the marking.

THIS DOOR TO REMAIN UNLOCKED DURING BUSINESS HOURS

FIGURE 9.14 Decals
(Source: Courtesy of Rockwood® Manufacturing Company)

THIS DOOR TO REMAIN UNLOCKED WHILE BUILDING IS OCCUPIED

FIGURE 9.15 Decals
(Source: Courtesy of Rockwood® Manufacturing Company)

THESE DOORS TO REMAIN UNLOCKED WHILE BUILDING IS OCCUPIED

FIGURE 9.16 Decals
(Source: Courtesy of Rockwood® Manufacturing Company)

PROPERTIES

Finishes

Decals do not have architectural finishes and, depending on the manufacturer, are available in various background and text colors.

Grades

Decals are not typically categorized in grades.

Materials

Decals are most typically manufactured from plastic.

TYPES

There are various types of decals distinguished by shape and size.

OPTIONS

There are typically no options for decals other than the size, material, color, text, and fastener.

QUANTITIES

Decals are typically installed one per door leaf, but a door might have multiple decals, depending on the code, application, and intent.

APPLICATIONS

Decals are typically applied to the face of or above a door but can be installed anywhere on the wall next to the door, depending on the codes and intent.

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INSTALLATION

Fasteners

Decals are typically adhered.

Locations

Decals do not have a set location but are typically installed at the average sight height.

GATE LATCH

Also Known As: Gate lock

DESCRIPTION

Gate latches are typically used to secure a gate used for traffic control to prevent free traffic into an area. The latch is typically operated from the inside only by a small turn piece and cannot be operated from the outside without reaching over the gate to turn the knob.



FIGURE 9.17 Gate Latch
(Source: Courtesy of Rockwood® Manufacturing Company)

PROPERTIES

Finishes

Depending on the manufacturer, gate latches are typically available in limited architectural finishes to match other installed hardware on the door such as hinges or pivots.

Grades

Gate latches are not typically categorized in grades.

Materials

Gate latches are most typically manufactured from brass but can be manufactured from bronze, steel, or other metal materials, depending on the manufacturer.

TYPES

There are various types of gate latches, distinguished by shape, size, and finish.

OPTIONS

There are typically no options for gate latches other than the size, material, finish, and fasteners.

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QUANTITIES

Gate latches are typically installed one per door leaf but a door might have multiple decals depending on the application and intent.

APPLICATIONS

Gate latches are typically applied to the face of a gate and latch into a strike on the frame or post.

INSTALLATION

Fasteners

Gate latches are typically installed with screw fasteners provided by the manufacturer.

Locations

Gate latches do not have a set location but are typically installed at the top end of the gate closest to one's reach while still securing the gate properly.

GUARD

Also Known As: Door Guard

DESCRIPTION

A door guard is used as a secondary or tertiary precaution, typically on dwelling or hotel entrance doors. This device allows a mechanical means to ensure privacy on the interior of a locked and secure side of the door. Guard protection plates are available to avoid damage to a door that might use the guard to keep the door unlocked. An example would be flipping the guard while the door is open while going for ice in a hotel room so that the door does not lock. With the plate, the guard strikes the plate in lieu of the door, preventing damage to the painted or stained metal or wood surface of a door.

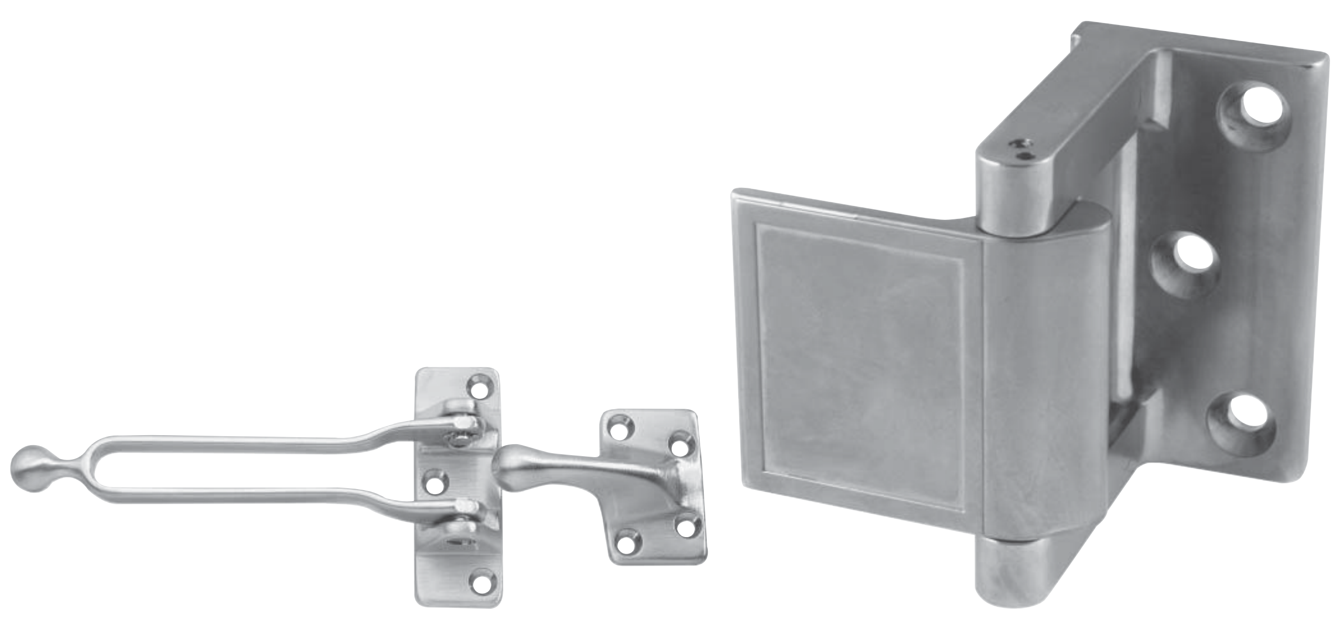


FIGURE 9.18 Guard
(Source: Courtesy of Rockwood® Manufacturing Company)

FIGURE 9.19 Guard
(Source: Courtesy of Rockwood® Manufacturing Company)

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PROPERTIES

Finishes

Depending on the manufacturer, door guards are available in most architectural finishes to match other installed hardware on the door such as the hinges and lockset.

Grades

Door guards are not typically categorized in grades.

Materials

Door guards are most typically manufactured from a brass or aluminum but can also be manufactured from other materials such as bronze, steel, or stainless steel.

TYPES

There are various types of door guards, typically distinguished by shape and size, but all with the same intent: to protect and prevent a door from being opened by the outside.

OPTIONS

There are typically not many options for door guards other than the size, material, finish, fasteners, and the addition of a protection plate. This protection plate is typically installed on the frame or inactive leaf of a pair of doors and protects the same from the door guard if the door guard has been flipped into the open position while the door is open. With the door guard sticking through the opening, it creates a block for the door to close properly and pressure on the door and frame where the door guard separates the two, especially if there is a door closer or spring hinges adding additional pressure.

QUANTITIES

Door guards are typically installed one set per door leaf, which typically includes the guard on the frame or door, the strike on the opposite side, and an optional door guard protection plate.

APPLICATIONS

Door guards are typically applied to the back face of a door and are aligned on the door frame.



FIGURE 9.20 Guard Protection Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

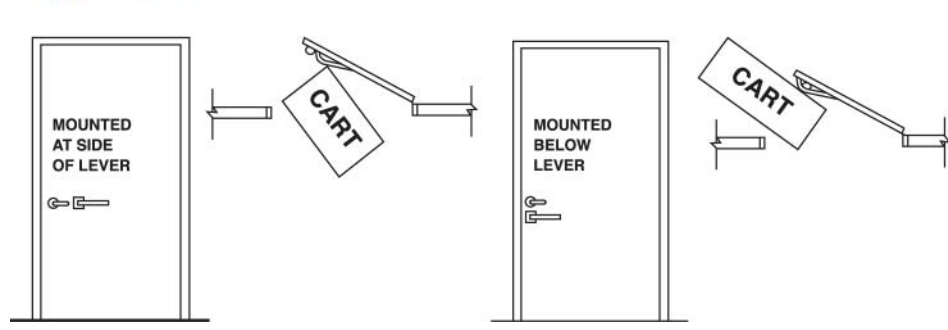


FIGURE 9.21 Door Guard Installed Open
(Source: Courtesy of Rockwood® Manufacturing Company)

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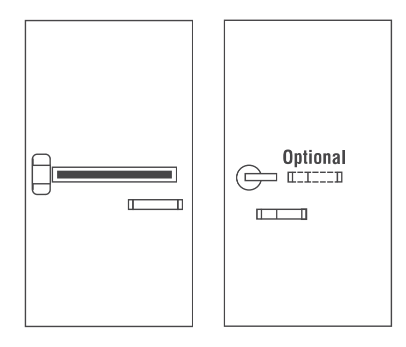


FIGURE 9.22 Door Guard Installed Closed
(Source: Courtesy of Rockwood® Manufacturing Company)

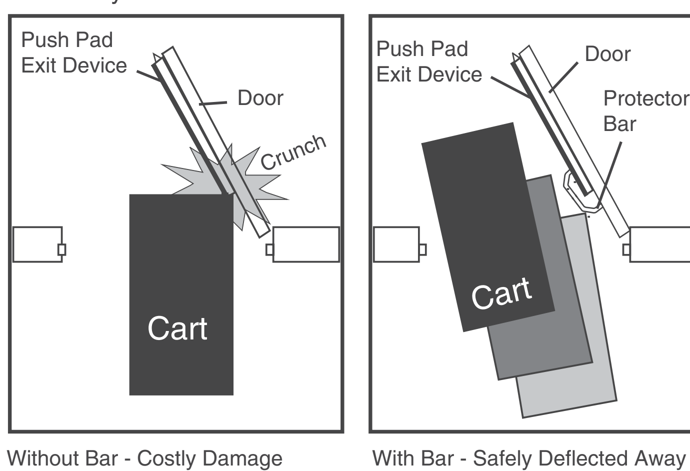


FIGURE 9.23 Door Guard in Use
(Source: Courtesy of Rockwood® Manufacturing Company)

INSTALLATION

Fasteners

Door guards are typically installed with screw fasteners provided by the manufacturer.

Locations

Door guards do not have a set location but are typically installed at the average sight height.

KNOCKERS

Also Known As: Door Knocker

DESCRIPTION

A door knocker is used as both a means of knocking on a door without using your hand or other foreign object, while incorporating an aesthetic into the door design.

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FIGURE 9.24 Door Knocker
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.25 Door Knocker
(Source: Courtesy of Rockwood® Manufacturing Company)

PROPERTIES

Finishes

Depending on the manufacturer, door knockers are available in most architectural finishes to match other installed hardware on the door such as the hinges and lockset.

Grades

Door knockers are not typically categorized in grades.

Materials

Door knockers are most typically manufactured from a brass but can also be manufactured from other materials such as aluminum, bronze, steel, or stainless steel.

TYPES

There are various types of door knockers, typically distinguished by shape and size, but all with the same intent: to knock on a door without having to use your hand or foreign object.

OPTIONS

There are typically not many options for door knockers other than the size, material, finish, fasteners, and the addition of a door viewer. The door viewer is typically installed on a dwelling or hotel door so that one can see who is on the other side of the door prior to opening the door to ensure as best as possible one's safety. By incorporating the viewer into the knocker, a separate preparation, installation, and finished product are not necessary on the door as it is incorporated into one device instead of two separate devices.

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FIGURE 9.26 Door Viewer/Knocker
(Source: Courtesy of Rockwood® Manufacturing Company)

QUANTITIES

Door knockers are typically installed one set per door leaf.

APPLICATIONS

Door knockers are typically applied to the front face of a door.

INSTALLATION

Fasteners

Door knockers are typically installed with screw fasteners provided by the manufacturer.

Locations

Door knockers do not have a set location but are typically installed at the average sight height.

LATCH PROTECTOR

Also Known As: Latch Guard

DESCRIPTION

A typical latch protector is installed on the door to protect the latch from being tampered with while in the locked position. Some latch protectors are available to protect the latch of a vertical rod exit device on the face of a door while others are available to be installed behind the rose of a cylindrical or bored lockset to use the lockset's through-bolts and installation as the fasteners instead of separate fasteners on the door.

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FIGURE 9.27 Latch Protector
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.28 Latch Protector
(Source: Courtesy of Rockwood® Manufacturing Company)

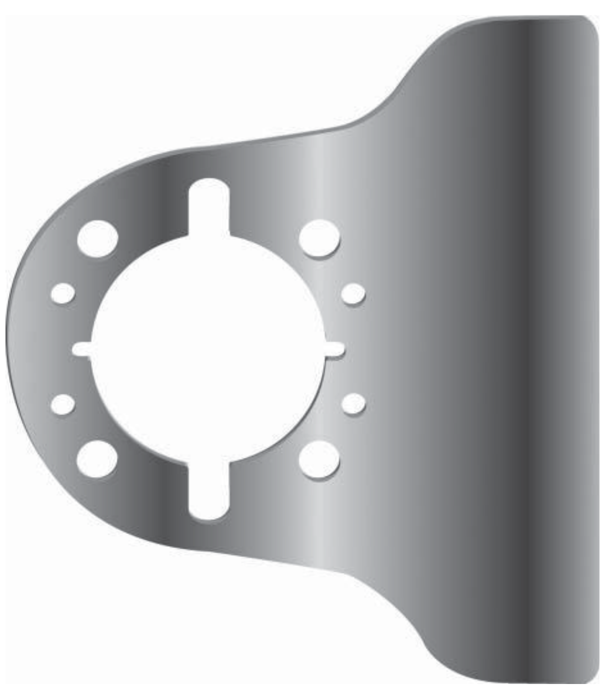


FIGURE 9.29 Cylindrical Lock Latch Protector
(Source: Courtesy of Rockwood® Manufacturing Company)

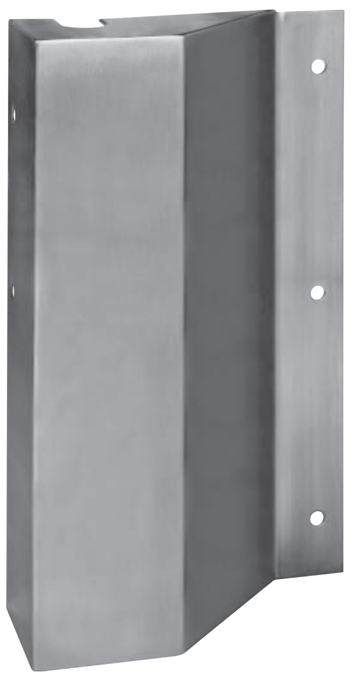


FIGURE 9.30 Vertical Rod Latch Protector
(Source: Courtesy of Rockwood® Manufacturing Company)

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PROPERTIES

Finishes

Depending on the manufacturer, latch protectors are typically available in very limited architectural finishes to match other installed hardware on the door such as the hinges and lockset.

Grades

Latch protectors are not typically categorized in grades.

Materials

Latch protectors are most typically manufactured from steel or stainless steel but can also be manufactured from other materials such as aluminum, bronze, or brass.

TYPES

There are various types of latch protectors typically distinguished by various shapes and sizes, but all with the same intent: to prevent the latch of a lockset from being accessed and tampered with for unauthorized entry.

OPTIONS

There are typically not many options for latch guards other than the size, material, finish, type of device and latch it is protecting, and fasteners.

QUANTITIES

Latch guards are typically installed one per door leaf.

APPLICATIONS

Latch guards are typically applied to the front face of the latch edge of a door.

INSTALLATION

Fasteners

Latch guards are typically installed with screw fasteners provided by the manufacturer but can also be through-bolted, depending on the other hardware installed near or at the same location as the latch guard.

Locations

Latch guards are typically installed centered over the locking device on the latch edge outside face of a door.

LETTERBOX PLATES

Also Known As: Mail Slot

DESCRIPTION

Letterbox plates are also referred to as mail slots and are typically frames for a cutout in the face of a door that is used to accept mail inside the home without having to open the door. Mail slots would be

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an alternative to a mail box and typically have a spring door that lifts up to expose the hole for mail entry, and then the spring tension automatically closes the door over the hole to protect the interior from weather or unwanted bugs or critters.

PROPERTIES

Finishes

Depending on the manufacturer, letter box plates are typically available in most architectural finishes to match other installed hardware on the door such as the hinges and lockset.

Grades

Letter box plates are not typically categorized in grades.

Materials

Letter box plates are most typically manufactured from brass, bronze, steel, or stainless steel but can also be manufactured from other materials such as aluminum.

TYPES

There are various types of letter box plates, typically distinguished by shape and size, but all with the same intent: to be used in lieu of a mail box and to allow mail to be slipped into the home without having to open the door.

OPTIONS

There are typically not many options for letter box plates other than the size, material, finish, and fasteners. The only other option would be a sleeve that is installed on the inside of the door to direct the mail to a certain location inside of the door such as a basket underneath or attached to the inside face of the door.

QUANTITIES

Letter box plates are typically installed one per door leaf.

APPLICATIONS

Letter box plates are typically applied to both sides of the center face of a door toward the bottom, sandwiching the door in between the frame plates.

INSTALLATION

Fasteners

Letter box plates are typically installed with screw fasteners provided by the manufacturer but can also be through-bolted, depending on the other hardware installed near or at the same location such as the latch guard.

Locations

Letter box plates are typically installed centered in the door toward the bottom half of the door but they can be installed at the user's preference.

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MAGNETIC CATCH

Also known As: Mag Catch, Magnetic Latch

DESCRIPTION

Magnetic catches are typically used on doors that are not frequently used but that need to lock and also on doors that must stay in the closed position in the frame without being able to swing freely.



FIGURE 9.31 Magnetic Catch
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.32 Magnetic Catch
(Source: Courtesy of Rockwood® Manufacturing Company)

PROPERTIES

Finishes

Depending on the manufacturer, magnetic catches are typically available in most architectural finishes to match other installed hardware on the door such as the hinges and lockset.

Grades

Magnetic catches are not typically categorized in grades.

Materials

Magnetic catches are most typically manufactured from brass, bronze, steel, or stainless steel but can also be manufactured from other materials such as aluminum.

TYPES

There are various types of magnetic catches, typically distinguished by shape and size, but all with the same intent: be installed to align on the door and frame in order to keep the door in the closed position without the leaves latching and locking. Push and pulls are typically used with this device (see chapter 4 Operating Trim). Magnetic catches do not typically have enough holding force to hold a

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door leaf in the open position. If you have this type of application, a manual or Electromagnetic Door Holder (See Chapter 7) are devices that might suit the application.

OPTIONS

There are typically not many options for magnetic catches other than the size, material, finish, and fasteners.

QUANTITIES

Magnetic catches are typically installed one per door leaf.

APPLICATIONS

Magnetic catches are typically applied to the top jamb of the door frame, while the strike plate is affixed to the door.

INSTALLATION

Fasteners

Magnetic catches are typically installed with screw fasteners provided by the manufacturer but can also be through-bolted, depending on the door material.

Locations

Magnetic catches are typically installed at the top or head of the door and frame but could be used on the latch and strike edge of the door.

ROLLER LATCH

DESCRIPTION

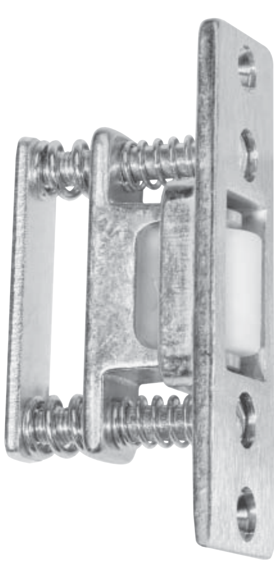




FIGURE 9.33 Roller Latch
(Source: Courtesy of Rockwood® Manufacturing Company)

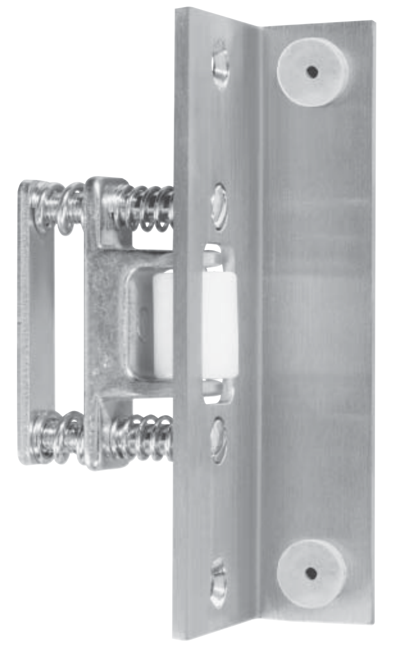



FIGURE 9.34 Roller Latch with Angle Stop
(Source: Courtesy of Rockwood® Manufacturing Company)

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PROPERTIES

Finishes

Depending on the manufacturer, roller latches are typically available in most architectural finishes to match other installed hardware on the door such as the hinges and lockset.

Grades

Roller latches are not typically categorized in grades.

Materials

Roller latches are most typically manufactured from aluminum, but can also be manufactured from other metal materials such as brass, bronze, steel, or stainless steel.

TYPES

There are various types of roller latches typically distinguished by various shapes and sizes, but all with the same intent: to latch the door into the frame to secure it in place in the closed position.

OPTIONS

There are typically not many options for roller latches other than the size, material, finish, and fasteners.

QUANTITIES

Roller latches are typically installed one per door leaf.

APPLICATIONS

Roller latches are typically applied to both the top of the door and the strike plate on the head of the door frame. This device can also be installed on the lock and strike side of the door and frame.

INSTALLATION

Fasteners

Roller latches are typically installed with screw fasteners provided by the manufacturer.

Locations

Roller latches are typically installed at the top of the door and frame, although they can be installed on the strike and latch side of the door.

SIGNAGE—ROOM NAME PLATES AND NUMBERS

Also Known As: Signs, Room Names, Room Numbers, Room Signs

DESCRIPTION

Room name and number plate signage is used to provide room names and numbers for the public and users to easily identify them, such as “Men’s,” “Women’s,” or “Room 232A.” Signs might also be used to identify other room types such as those that the public should avoid such as “Janitor’s Closet” or “Boiler Room.”

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FIGURE 9.35 Room Name Plate
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.36 Room Name Plate
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.37 Room Name Plate
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.38 Room Name Plate
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.39 Room Name Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

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FIGURE 9.40 Room Name Plate
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.41 Room Name Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

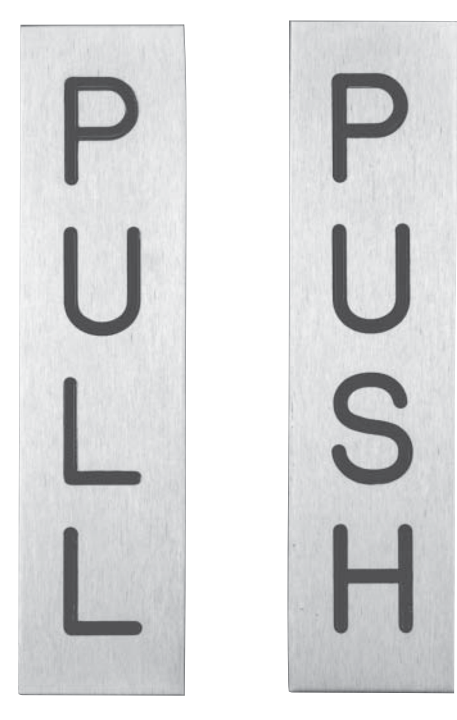


FIGURE 9.42 Door Name Plate
(Source: Courtesy of Rockwood® Manufacturing Company)

PROPERTIES

Finishes

Depending on the manufacturer, room name and number signs are typically available in various background and text colors with framing to match some architectural finishes on other installed hardware on the door such as the hinges and lockset.

Grades

Room name and number signs are not typically categorized in grades.

Materials

Room name and number signs are most typically manufactured in plastic or metal with paint used to create or accentuate any engraved writing.

TYPES

There are various types of room name and number signs, typically distinguished by shape, size, background, framing, and text colors and materials.

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OPTIONS

There are typically not many options for room name and number signs other than size, material, finish, background, framing, and text colors and materials.

QUANTITIES

Room numbers and name signs are typically custom-created and installed, and there is no set quantity.

APPLICATIONS

Room number and name signs are typically applied to the face of a door or next to the door on the adjacent wall.

INSTALLATION

Fasteners

Room number and name signs are typically adhered to the door or wall but can also be applied with screw fasteners provided by the manufacturer.

Locations

There is no set location for room number and name signs but are typically installed at normal sight height.

SILENCERS

DESCRIPTION

A silencer is a small rubber piece installed in the frame to mute the sound of the door's impact. Hollow metal silencers have a different configuration than wood ones, but both products serve the same purpose and have the same result.

On a single door frame, three silencers are specified on the strike jamb of the frame; on a pair of doors, only two are specified. (This is because there is no strike jamb. The inactive door is the secure entity, so the silencers are installed on the head of the frame—one for each door at the latch side.)



FIGURE 9.43 Metal Frame Door Silencer
(Source: Courtesy of Rockwood® Manufacturing Company)



FIGURE 9.44 Wood Frame Door Silencer
(Source: Courtesy of Rockwood® Manufacturing Company)

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PROPERTIES

Finishes

Silencers are typically available in gray but depending on the manufacturer might be available in other colors such as black, white, or brown.

Grades

Silencers are not typically categorized in grades.

Materials

Silencers are most typically manufactured from a rubber material but can also be manufactured from a plastic material.

TYPES

There are typically three types of silencers, those manufactured to be inserted into metal door frames, those manufactured to be inserted into wood door frames, and those that are adhered to any material door frame.

OPTIONS

There are typically no options for door silencers other than the type of application.

QUANTITIES

Silencers are typically installed three per single door leaf and two per pair of doors. Single doors have three silencers installed along the latch edge of the frame, while pairs have one installed at the latch edge of the head of each door leaf.

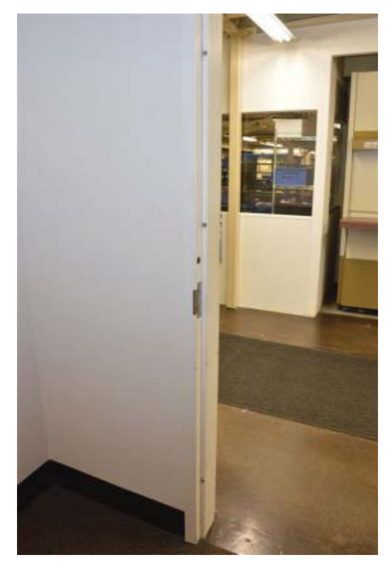


FIGURE 9.45 Single Metal Door Frame Silencer Installed
(Source: Courtesy of Scott J. Tobias)



FIGURE 9.46 Pair Metal Door Frame Silencer Installed Close Up
(Source: Courtesy of Scott J. Tobias)

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FIGURE 9.47 Pair Metal Door Frame Silencer Installed
(Source: Courtesy of Scott J. Tobias)

APPLICATIONS

Silencers are typically applied to the latch edge of a single door and the latch edge head of both leaves of a pair of doors.

INSTALLATION

Fasteners

Silencers do not typically require fasteners, as they are inserted into preparation holes in the door frame unless they are adhesive silencers that stick to the door frame instead of being inserted in them. Adhesive silencers might be required at the last minute during installation if the door frame supplier did not order the frames prepared to accept the conventional silencers.

Locations

Silencers are typically installed at equal locations on the door frame as determined by the manufacturer of the door frame.

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VERTICAL ROD COVER

Also Known As: Rod Cover, Rod Protector

DESCRIPTION

A vertical rod cover is typically used to protect the rods of a surface-mounted vertical rod exit device from being struck by an object, such as a cart of equipment, or from being tampered with. These covers were also invented to accommodate an accessibility standard that prevents objects from projecting off the face of a door. By having these sloped covers, some devices are able to comply with this accessibility standard.



FIGURE 9.48 Vertical Rod Cover
(Source: Courtesy of Rockwood® Manufacturing Company)

PROPERTIES

Finishes

Depending on the manufacturer, vertical rod covers are typically available in most architectural finishes to match other installed hardware on the door such as the hinges and lockset.

Grades

Vertical rod covers are not typically categorized in grades.

Materials

Vertical rod covers are most typically manufactured from steel or stainless steel but can also be manufactured from other materials such as aluminum, bronze, or brass.

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TYPES

There are various types of vertical rod covers, typically distinguished by various shapes and sizes, but all with the same intent: to prevent the rod of a surface vertical rod device from being damaged by an object moving through the opening, from being tampered with, or to comply with an accessibility code or standard.

OPTIONS

There are typically not many options for vertical rod covers other than the size, material, finish, type of device and latch it is protecting, and fasteners.

QUANTITIES

Vertical rod covers are typically installed one per door leaf.

APPLICATIONS

Vertical rod covers are typically applied to the front face of the bottom latch edge of a door.

INSTALLATION

Fasteners

Vertical rod covers are typically installed with screw fasteners provided by the manufacturer but can also be through-bolted, depending on the other hardware installed near or at the same location as the latch guard.

Locations

Vertical rod covers are typically installed covering the bottom surface vertical rod of an exit device.

VIEWER

Also Known As: Door Viewer, Peephole

DESCRIPTION

Door viewers are typically used to see who is on the other side of the door without having to open the door, to ensure one's safety as best as possible before opening the door. A viewer is most typically used



FIGURE 9.49 Door Viewer
(Source: Courtesy of Scott J. Tobias)

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FIGURE 9.50 Door Viewer
(Source: Courtesy of Scott J. Tobias)

in dwellings and hospitality entrance doors, although they can be used on any type of door, including office entrances.

PROPERTIES

Finishes

Depending on the manufacturer, door viewers are typically available in most architectural finishes to match other installed hardware on the door such as the hinges and lockset.

Grades

Door viewers are not typically categorized in grades.

Materials

Door viewers are most typically manufactured from brass, bronze, steel, or stainless steel but can also be manufactured from other materials such as aluminum.

TYPES

There are various types of door viewers typically distinguished by shape and size. Some door viewers are manufactured into door knockers so that the two devices are incorporated into one instead of having two separate devices installed on the door.

OPTIONS

There are typically not many options for door viewers other than the size, material, finish, and fasteners. The only other option would be the viewing field, whether it was a full 180 degrees or a certain limited viewing area that might be less.

QUANTITIES

Door viewers are typically installed one per door leaf.

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APPLICATIONS

Door viewers are typically applied to both sides of the center face of a door at average sight level, sandwiching them the door in between the parts of the device.

INSTALLATION

Fasteners

Door viewers are typically installed with screw fasteners provided by the manufacturer.

Locations

Door viewers are typically installed centered in the door at average sight height and typically lower if used on an accessible room such as in a hotel or dwelling.

WIRE PULL

Also Known As: Pull, Drawer Pull, Door Pull

DESCRIPTION

Wire pulls are typically used on drawers or small doors or cabinets that do not require a high frequency of use. These pulls are not very durable and are not typically used on full-sized doors.



FIGURE 9.51 Wire Pull
(Source: Courtesy of Rockwood® Manufacturing Company)

PROPERTIES

Finishes

Depending on the manufacturer, wire pulls are typically available in most architectural finishes to match other installed hardware on the door such as the hinges and lockset.

Grades

Wire pulls are not typically categorized in grades.

Materials

Wire pull plates are most typically manufactured from brass, bronze, steel, or stainless steel but can also be manufactured from other materials such as aluminum.

TYPES

There are various types of wire pulls typically distinguished by various shapes and sizes or lengths known as center-to-center dimensions. This is a consistent measurement that allows proper preparation of the door for fastener locations as pulls are typically longer than the screw hole locations, which are centered in the posts of the pull.

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OPTIONS

There are typically not many options for wire pulls other than the size/center-to-center dimension, material, finish, and fasteners.

QUANTITIES

Wire pulls are typically installed one per door leaf, although they might be installed back to back where they are at the same exact location on both sides of the door and typically connected by the same fastener, utilizing set screws for the concealed installation.

APPLICATIONS

Wire pulls are typically applied to one side of the door with screws holding it from behind, although back-to-back applications might be desired if the door is operated from both sides of the opening.

INSTALLATION

Fasteners

Wire pulls are typically installed with screw fasteners provided by the manufacturer.

Locations

Wire pulls might be treated as door pulls and in that case should be installed at locations as recommended by industry standards and codes, depending on the door type, which are typically measured from the finished floor.

CUSTOM STEEL DOORS AND FRAMES

Custom steel doors and frames are recommended to have the centerline of a door pull installed at 42 inches above the finished floor.

FLUSH WOOD DOORS AND FRAMES

Flush wood doors and frames are recommended to have the centerline of a door pull installed at 42 inches above the finished floor.

STANDARD STEEL DOORS AND FRAMES

Standard steel doors and frames are recommended to have the centerline of a door pull installed at 42 inches above the finished floor.

SMOKE AND FIRE DETECTION DEVICES

Any items not listed in Chapter 5 or any other previous chapters should be listed at this point in any hardware schedule or specification.

REFERENCES

Codes and standards are available to set the minimum requirements of door openings, (see the Introduction of this book for more information). Some jurisdictions have specific codes and standards, which were either modified from another existing code or created for their own use.

Language and section numbers can change slightly or drastically when the codes are updated. Look for an outline, if available, of the changes that took place in the respective update.

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CODES

International Building Code (IBC)

The following are chapters of a modified or fully adopted version of the International Building Code, which refer to miscellaneous items or door hardware in general:

- Chapter 7: Fire and Smoke Protection Features
- Chapter 10: Means of Egress
- Chapter 17: Special Inspections and Tests

National Fire Protection Association (NFPA) 101: Life Safety Code

The following is a chapter of a modified or fully adopted version of the NFPA 101: Life Safety Code, which refers to miscellaneous items or door hardware in general:

- Chapter 7: Means of Egress

STANDARDS

ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)

The following is a chapter of a modified or fully adopted version of the ADA Accessibility Guidelines for Buildings and Facilities, which refers to miscellaneous items or door hardware in general:

- Chapter 4: Accessible Routes

ASTM International (ASTM)

There are hundreds of ASTM International testing standards that are related to doors and door hardware, from material and assembly testing to installation and application testing.

Door and Hardware Institute (DHI)

The following are technical documents available for reference that refer to miscellaneous items or door hardware in general:

- Abbreviations and Symbols
- Basic Architectural Hardware
- Hardware for Healthcare Facilities
- Installation Guide for Doors and Hardware
- Processing Hardware for Custom Aluminum Entrances
- Recommended Locations for Builders Hardware Custom Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Flush Wood Doors
- Recommended Procedures for Processing Hardware Schedules and Templates
- Sequence and Format for the Hardware Schedule
- Tech-Talk ASD-1 Aluminum Storefront Doors
- Tech Talk PH-1 Protective Hardware

International Code Council A117.1 Accessible and Usable Buildings and Facilities (ICC)

The following is a chapter of a modified or fully adopted version of the ICC A117.1 Accessible and Usable Buildings and Facilities, which refers to miscellaneous items or door hardware in general:

- Chapter 4: Accessible Routes

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National Fire Protection Association (NFPA)

The following are chapters of a modified or fully adopted version of NFPA 80: Standard for Fire Doors and Other Opening Protectives, which refer to miscellaneous items or door hardware in general:

- Chapter 5: Care and Maintenance
- Chapter 6: Swinging Doors with Builders Hardware
- Chapter 7: Swinging Doors with Fire Door Hardware
- Chapter 8: Horizontally Sliding Doors
- Chapter 9: Special-Purpose Horizontally Sliding Accordion or Folding Doors
- Chapter 16: Access Doors
- Chapter 19: Installation, Testing, and Maintenance of Fire Dampers
- Annex A: Explanatory Material

The following is a chapter of a modified or fully adopted version of NFPA 105: Standard for Smoke Door Assemblies and Other Opening Protectives, which refers to miscellaneous items or door hardware in general:

- Chapter 6: Installation, Testing, and Maintenance of Smoke Dampers

The following is a chapter of a modified or fully adopted version of NFPA 252: Standard Method of Fire Tests of Door Assemblies, which refers to miscellaneous items or door hardware in general:

- Chapter 5: Fire Door Assembly
- Annex B: Commentary

American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA)

The following are standards that refer to miscellaneous items or door hardware in general:

- ANSI/BHMA A156.6 American National Standard for Architectural Door Trim
- ANSI/BHMA A156.16 American National Standard for Auxiliary Hardware
- ANSI/BHMA A156.18 American National Standard for Materials and Finishes

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10

Miscellaneous Items

COMPUTERS

Also Known As: Personal Computers, PCs, Computers, Laptops

DESCRIPTION

Computers might be necessary to run software to operate the electronic door hardware and integrate into any other systems such as fire or burglar alarm monitoring systems. Some door hardware manufacturers require the use of their own software to operate the system, which means that the devices all have to come from the same manufacturer, while others allow open compatibility, also known as open architecture, which allows a multitude of devices and software to talk to each other and operate together in the same environment regardless of who the manufacturer is.

There are many properties, types, options, quantities, applications, and installations offered by various manufacturers, and each system should be designed by an experienced professional specific to each client and the users of the system.

DRAWINGS AND DIAGRAMS

Also Known As: Elevation Drawings or Diagrams, Point-to-Point Drawings or Diagrams, Wiring Drawings or Diagrams, Point-to-Points, Elevations

Drawings and diagrams should be required at minimum for each electrified door opening, no matter how little or how much or how few or how many electrification or devices are being used. These drawings and diagrams should be specified in the project specifications but are not necessarily part of the specifications.

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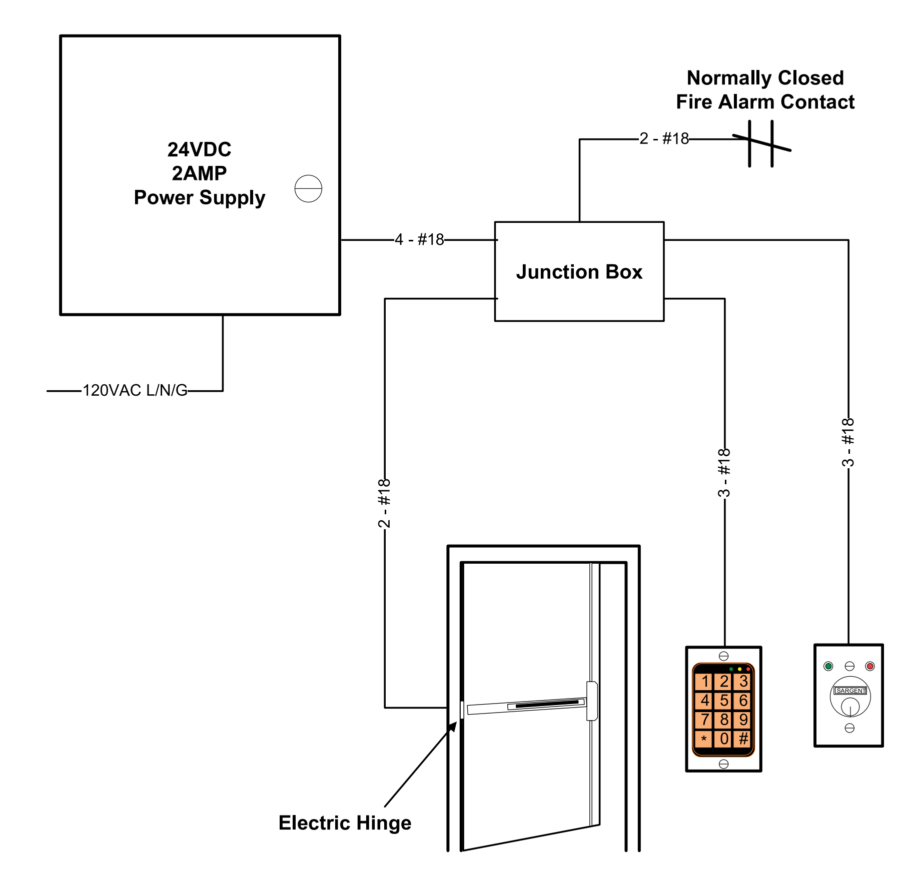


FIGURE 10.1 Elevation Drawing (continues)

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

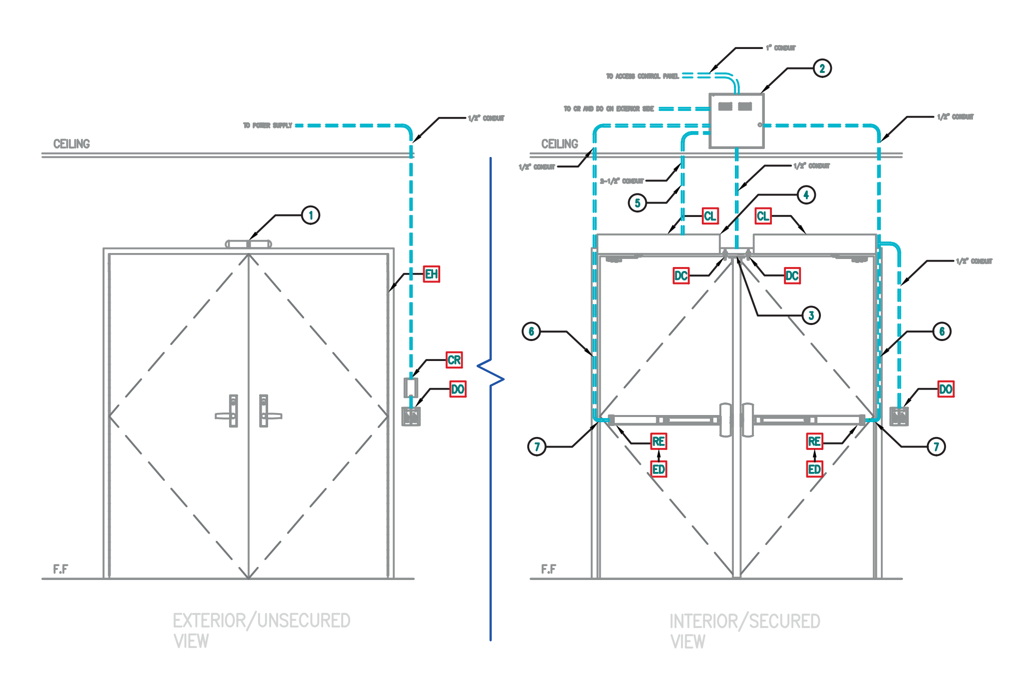


FIGURE 10.2 Elevation Drawing

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

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TYPES

Elevation

Elevation drawings have a front- or back-facing view of the opening with clear labels showing all of the devices installed on the opening. The elevation is typically accompanied by an operations narrative, which describes how the opening will operate from either side at any given time. Each system should be designed by an experienced professional specific to each client and user of the system.

Point-to-Point Wiring

A point-to-point wiring diagram typically shows each device in a system with their respective colored wires attached to each other. This will help guide the installation electrician with wiring the system together and avoid any guessing or errors that might cause damage to the devices requiring replacement. Each system should be designed by an experienced professional specific to each client and user of the system.

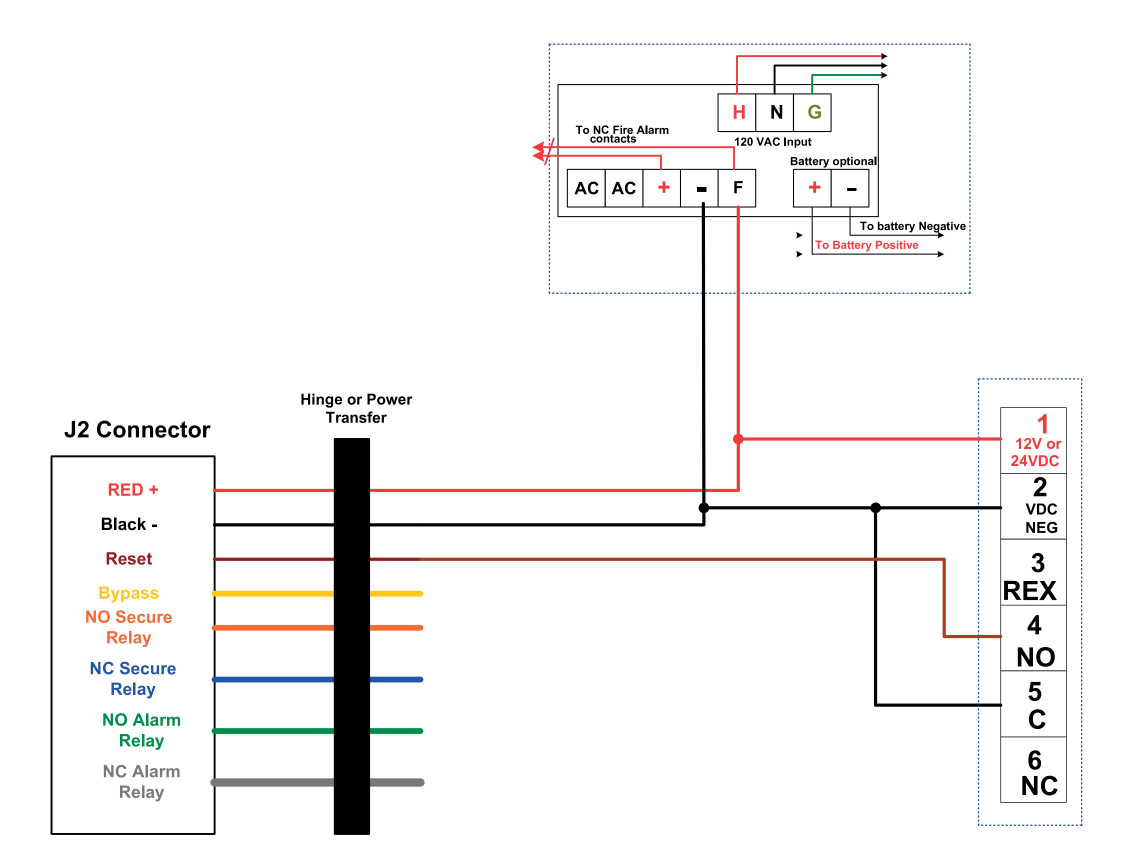


FIGURE 10.3 Point-to-Point Diagram
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ELECTROMECHANICAL HARDWARE

Any electromechanical hardware items not listed in any other part of the sequence or previous chapters should be listed at this point in any hardware schedule or specification.

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EXIT MOTION SENSOR

Exit motion sensors are used as part of some code egress requirements in addition to user preferences. Exit motion sensors might be required as part of some egress code requirements as a means to detect people approaching the door in order to release an electrified locking device without their having to have prior knowledge of the device or its release to allow their egress. These same codes typically require a pushbutton as a secondary emergency release separate from the main system to release the door in an emergency. Signage is typically required and part of the pushbutton installation in order to make the user aware of the device in an emergency. Each system should be designed by an experienced professional specific to each client and the users of the system.



FIGURE 10.4 Exit Motion Sensor
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FIGURE 10.5 Keypad
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KEYPAD

Keypads are used as a switch in a hardware system to authorize a user to engage the electrified locking device in order to gain entry through the door. The keypads typically have numeric buttons that are used to enter codes in order to gain authority to rotate the lever or knob and open the door. Keypads were the first type of keyless lockset in a mechanical form. Once the technology advanced in the industry, the electronic option became available. Each system should be designed by an experienced professional specific to each client and user of the system.



FIGURE 10.6 Keypad

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KEY SWITCH

A key switch can be an important part of an electrified hardware system. Key switches can be used to turn a system on and off; for example, the first one into an office in the morning can turn off an alarm system or the requirement to use a card key in the morning now that someone is there to monitor those entering the space. This allows the system to rest and not cycle over and over if there is no reason to monitor the opening remotely or while there are people occupying the space. The key switch would also be used to engage or turn on a system or requirement for a card reader to be used once the office is closed for the day.

Key switches can be manufactured to accept both mortise and rim-type cylinders (for more information on cylinder types, please see Cylinders in Chapter 2). Each system should be designed by an experienced professional specific to each client and user of the system.

POWER SUPPLY

Power supplies are a very important piece of an electrified hardware system. Power supplies typically take in high raw power from the power companies then transform, store, and regulate the output of power as necessary for the system. Device requirements and quantity, as well as their location, determines the power supply requirements. Amps and voltage capacities must be compatible in order

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FIGURE 10.7 Key Switch

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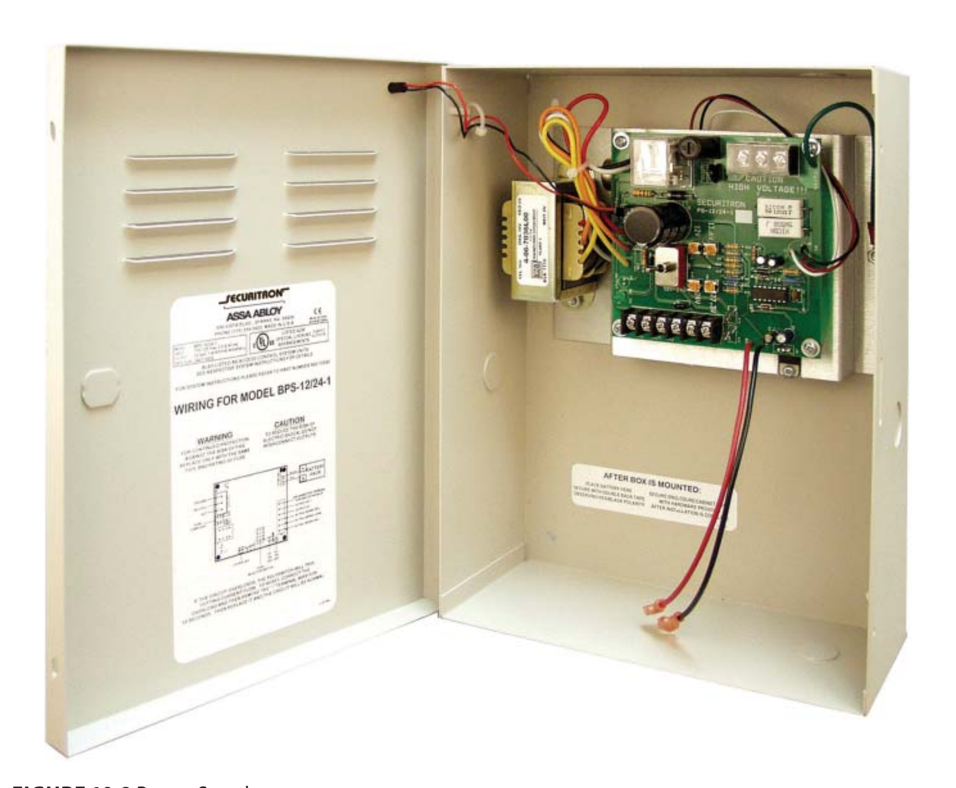


FIGURE 10.8 Power Supply

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for the system to operate optimally if not at all. With the proper configuration, one power supply can power one or multiple devices. The wiring distance of devices from the power supply can also vary, depending on the system as a whole, and each system is specific to the user and should be designed by an experienced professional.

Taking in the raw power from the power company and regulating it is important to protect the devices and the system from power surges, shorting out, and damaging the device or system where replacing materials might be required. The regulator "cleans" the energy and allows an even clean output of required voltage, such as 24 volts AC (alternating current).

POWER TRANSFER

A power transfer device would be used to transfer power from the frame to the door, and to the electronic locking device on the door. This device would be used in lieu of an electric transfer hinge, which has the same function. Some manufacturers have a much higher power rush than others to operate their electrified locking device and might require a power transfer in lieu of an electric transfer hinge, as the hinge might not be able to handle the in-rush of power, which would damage the hinge and possibly the device. Each system should be designed by an experienced professional specific to each client and user of the system.

PUSHBUTTON

A pushbutton is a switch in a hardware system to authorize the unlocking of an electrified locking device from the egress or nonsecure side of the door. Users typically use a pushbutton as a secondary



FIGURE 10.9 Power Transfer

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)



FIGURE 10.10 Power Transfer

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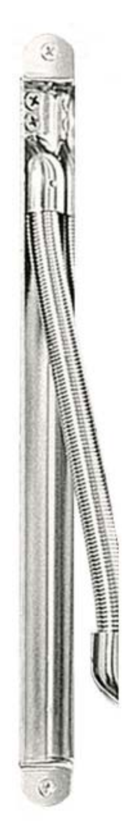


FIGURE 10.11 Power Transfer

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)



FIGURE 10.12 Pushbutton

(Source: Courtesy of copyright © 2002–2013, Securitron Magnalock Corporation, an ASSA ABLOY Group Company)

means of releasing a device in an emergency and when the primary device, typically an exit motion sensor, is not operating properly. This device is typically required by egress codes but also might be a preferred option of a user. Each system should be designed by an experienced professional specific to each client and user of the system.

OPTIONS

AMPERE (AMP)

Devices are available with various amperage requirements, which in turn require the proper amperage from a power supply. Some power supplies might allow for 2 amps, which would allow many devices to connect to the power supply as long as the total is less than 2 amps. For example, three 1/2-amp devices such as three mortise locksets within a certain allowable distance of the power supply would equal 1 1/2 amps in total, under the 2-amp total allowance of the power supply. Each system should be designed by an experienced professional specific to each client and user of the system.

BATTERY

Some power supplies have battery backups that are always charging when in operation, and if there is a power loss the battery will take over for a certain period. The logic is that the battery would hopefully supply power until the power comes back up, but depending on the system, size, power load, and period of the outage, the system may not operate after a short period of time. Each system should be designed by an experienced professional specific to each client and user of the system.

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CURRENT

Current requirements differ by manufacturer and device. Available as an alternating or direct current, devices must be coordinated properly in order to have proper operation and function. Each system should be designed by an experienced professional specific to each client and user of the system.

Alternating Current (AC)

Alternating current (AC) is the typical power used in our homes and standard outlets. The current is sent to and from the device, alternating in direction. If you ever noticed a buzzing sound at a door with an electric strike when power is sent to it, you are likely hearing the alternating current running through the device. Each system should be designed by an experienced professional specific to each client and user of the system.

Direct Current (DC)

Direct current (DC) can eliminate the buzzing sound and is typically a one-way current similar to that of a battery. Each system should be designed by an experienced professional specific to each client and user of the system.

VOLTAGE

Voltage requirements differ by manufacturer and device. Available with various voltages such as 12 VAC or DC, and 24 VAC or DC, devices must be coordinated properly in order to have proper operation and function. Each system should be designed by an experienced professional specific to each client and user of the system.

KEY CONTROL CABINETS

Key control cabinets should be specified and detailed along with a comprehensive key control plan to help the owner and user maintain key control and security of their building and facility. There are many options for key cabinets and control systems, with each system being specific to each user. All systems should be designed by an experienced professional.

KEY CONTROL SOFTWARE

Key control software is available for both electronic and mechanical key systems. Some manufacturers offer these software programs, as do third-party vendors, who offer numerous options for maintaining a key system. There are many options for key control software; each system is specific to each user and should be designed by an experienced professional.

MANUALS

Manuals should be specified and detailed to ensure that the owner and users of the facility or building have access to all product nomenclature, model numbers, installation guides, user manuals, and any other literature and collateral available to assist them with the smooth operation and maintenance of their facility.

New technologies are emerging, such as Building Information Modeling (BIM), which is the 3D representation of the drawings and specifications for a building being designed and built, prior to the

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physical construction of the building. This new technology allows all "manuals" to be virtual and stored in a computer file rather than hardcopy binders as traditionally done. This technology allows for the troubleshooting, conflict resolution, accurate costing, timing, and coordination of all aspects of the construction project prior to its taking place in order to be more efficient and better prepared for the real thing.

Each system should be designed by an experienced professional specific to each client and user of the system.

WIRE

Wire is typically specified by the electrician but should be coordinated in the specifications and submittals for clarification of the wiring requirements and the party responsible for furnishing it. Some of the important aspects of wiring are the distance a wire can run from the power supply to the device. The wire gauge also plays an important part of the system design. The higher the gauge, the longer a distance the power will travel without dissipating. If the gauge is too small, and the distance is too long, the power will not operate the device properly, possibly preventing the system from operating optimally, causing damage to the devices or system or, more seriously loss, theft, or harm to the users of the building or facility. Wiring is an important part of the electrified hardware system and each system is specific to each user and should be designed by an experienced professional.

REFERENCES

Codes and standards are available to set the minimum requirements of door openings (see the Introduction of this book for more information). Some jurisdictions have specific codes and standards, which were either modified from another existing code or created for their own use.

Language and section numbers can change slightly or drastically when the codes are updated. Look for an outline, if available, of the changes that took place in the respective update.

CODES

International Building Code (IBC)

The following are chapters of a modified or fully adopted version of the International Building Code, 2012 that refer to miscellaneous items or door hardware in general:

- Chapter 7: Fire and Smoke Protection Features
- Chapter 10: Means of Egress
  - 4
- Chapter 17: Special Inspections and Tests

National Fire Protection Association (NFPA) 101: Life Safety Code

The following is a chapter of a modified or fully adopted version of the NFPA 101: Life Safety Code that refers to miscellaneous items or door hardware in general:

- Chapter 7: Means of Egress

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STANDARDS

ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)

The following is a chapter of a modified or fully adopted version of the ADA Accessibility Guidelines for Buildings and Facilities that refers to miscellaneous items or door hardware in general:

- Chapter 4: Accessible Routes

ASTM International (ASTM)

There are hundreds of ASTM International testing standards that are related to doors and door hardware, from material and assembly testing to installation and application testing.

Door and Hardware Institute (DHI)

The following are technical documents available for reference that refer to miscellaneous items or door hardware in general:

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- Basic Architectural Hardware
- Hardware for Healthcare Facilities
- Installation Guide for Doors and Hardware
- Processing Hardware for Custom Aluminum Entrances
- Recommended Locations for Builders Hardware Custom Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Standard Steel Doors & Frames
- Recommended Locations for Architectural Hardware for Flush Wood Doors
- Recommended Procedures for Processing Hardware Schedules and Templates
- Sequence and Format for the Hardware Schedule
- Tech-Talk ASD-1 Aluminum Storefront Doors
- Tech-Talk EAH-91 Electrified Architectural Hardware

International Code Council A117.1 Accessible and Usable Buildings and Facilities, (ICC)

The following is a chapter of a modified or fully adopted version of the ICC A117.1 Accessible and Usable Buildings and Facilities that refers to miscellaneous items or door hardware in general:

- Chapter 4: Accessible Routes

National Fire Protection Association (NFPA)

The following are chapters of a modified or fully adopted version of NFPA 80: Standard for Fire Doors and Other Opening Protectives that refer to miscellaneous items or door hardware in general:

- Chapter 5: Care and Maintenance
- Chapter 6: Swinging Doors with Builders Hardware
- Chapter 7: Swinging Doors with Fire Door Hardware
- Chapter 8: Horizontally Sliding Doors
- Chapter 9: Special-Purpose Horizontally Sliding Accordion or Folding Doors
- Chapter 16: Access Doors
- Chapter 19: Installation, Testing, and Maintenance of Fire Dampers
- Annex A: Explanatory Material

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The following is a chapter of a modified or fully adopted version of NFPA 105: Standard for Smoke Door Assemblies and Other Opening Protectives that refers to miscellaneous items or door hardware in general:

- Chapter 6: Installation, Testing, and Maintenance of Smoke Dampers

The following is a chapter of a modified or fully adopted version of NFPA 252: Standard Method of Fire Tests of Door Assemblies that refers to miscellaneous items or door hardware in general:

- Chapter 5: Fire Door Assembly
- Annex B: Commentary

American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA)

The following are standards that refer to miscellaneous items or door hardware in general:

- ANSI/BHMA A156.11 American National Standard for Cabinet Locks
- ANSI/BHMA A156.18 American National Standard for Materials and Finishes
- ANSI/BHMA A156.24 American National Standard for Delayed Egress Locking Systems
- ANSI/BHMA A156.25 American National Standard for Electrified Locking Devices

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